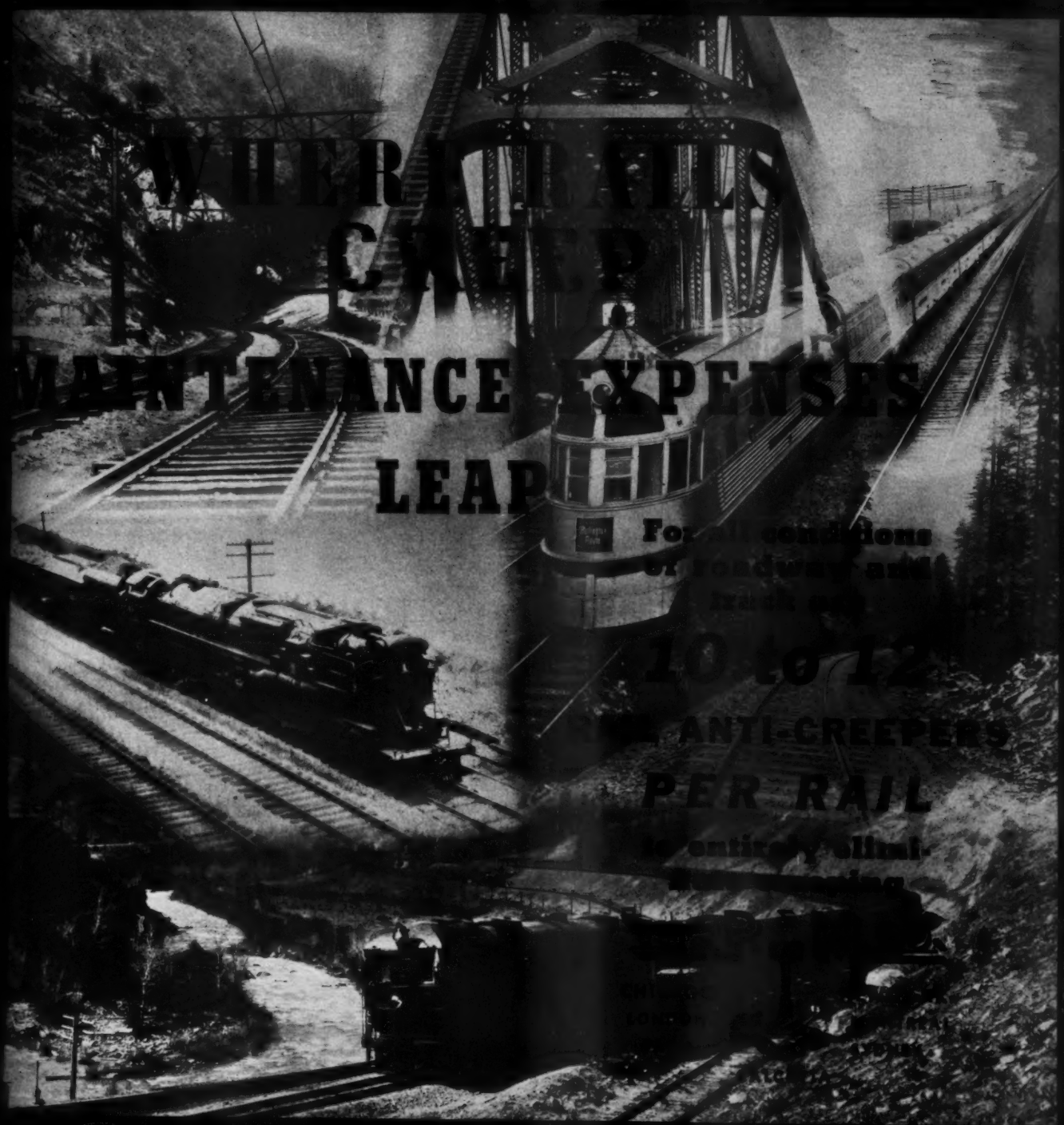
Railway Engineering and Maintenance



Reliance HY-CROME Spring Washers

FROG & CROSSING HY-CROME

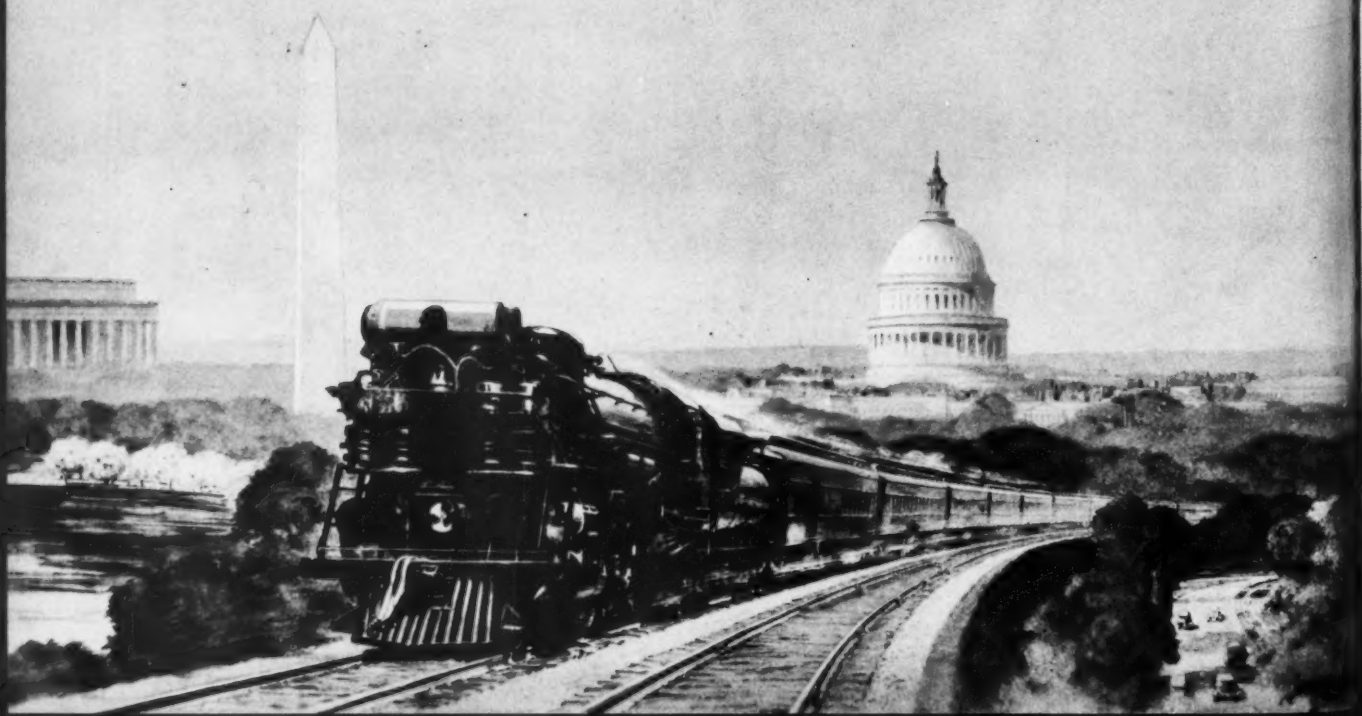
STANDARD HY-CROME

HY-PRESSURE HY-CROME

Edgemark of Quality

● The life of rail, for many years has been dependent to a great extent on track joint conditions. The improvement in the quality and design of track joint parts has prolonged the life of rail with considerable economy. Our new HY-PRESSURE HY-CROME Spring Washer, through the tension it maintains, and protection it affords in the assembly, has played an important part in this development.

● From the old style square edge carbon type of years ago to STANDARD HY-CROME, the pioneer round edge alloy spring washers, the HY-PRESSURE HY-CROME Spring Washer of today is real progress. The *George Washington*, crack train of the Chesapeake & Ohio Railroad, illustrated below, leaving Washington, D. C. also represents real progress in transportation.



EATON MANUFACTURING CO. RELIANCE SPRING WASHER DIVISION, MASSILLON, OHIO

Sales Offices: New York • Cleveland • Detroit • Chicago • St. Louis • San Francisco • Montreal

Published monthly by Simmons-Boardman Publishing Corporation, 105 W. Adams St., Chicago, Ill. Subscription price, United States and Possessions, and Canada, $2.00; Foreign $3.00. Single copies 35 cents. Entered as second-class matter January 20, 1923, at the postoffice at Chicago, Illinois, under the act of March 3, 1879, with additional entry at Mt. Morris, Ill., postoffice. Address communications to 105 W. Adams St., Chicago, Ill.

2-TAMPER SPOTTING with JACKSON TAMPERS

Above is a view of the Jackson Universal Tie Tamper equipped with a U-602BS Spotting Blade.

At right — H-3 on motor car. Note its simple, sturdy construction and 14 x 4 heavy duty tire for easy wheeling.

3 to 4 man section gangs do faster and better

SPOT TAMPING in any ballast — maximum amount uniformly tamped under each tie.

Here are a few more of the jobs small gangs do efficiently with Jackson Universals:

LIGHT SURFACING — in any ballast.

TIE RENEWALS — for quick removal of tight ballast in tie cribs.

DIGGING AND CLEANING hard cemented and foul ballast for proper drainage at tie ends, cribs and shoulders.

GRASS REMOVAL — Bermuda and other ballast infesting grasses are quickly uprooted.

ICE REMOVAL — at platforms, water columns, switches, frogs and flangeways.

The model H-3 power plant operates 2 Jackson Universals. Small and light, it sets in the clear between tracks, is easily rolled along the shoulder, over ballast and across ties. Write for new 2-Tamper folder which gives complete H-3 specifications.

Jackson Track Maintenance Methods are completely illustrated and described in a new booklet which will be sent upon request. SEE US AT THE RAILWAY SHOW, MARCH 14-17, INTERNATIONAL AMPHITHEATRE, CHICAGO.

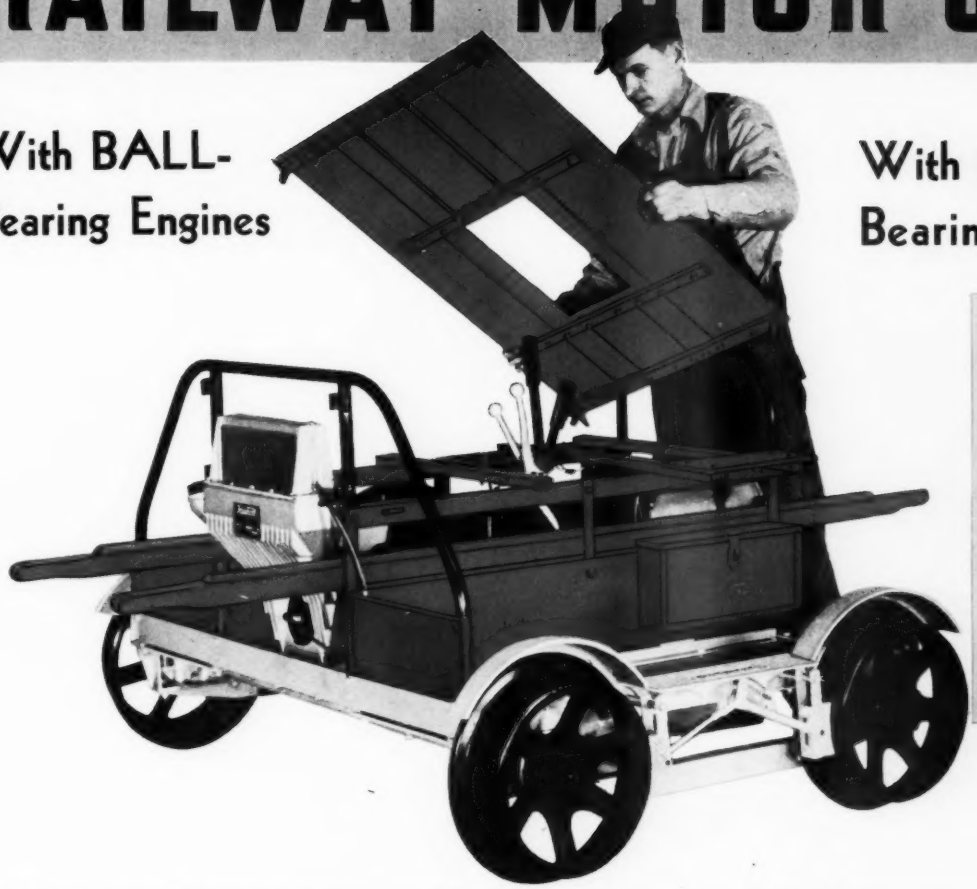
ELECTRIC TAMPER & EQUIPMENT CO., LUDINGTON, MICHIGAN

Fairmont ANNOUNCES

NEW SERIES OF RAILWAY MOTOR CARS

With BALL-Bearing Engines

With ROLLER-Bearing Engines



See at the
N.R.A.A. SHOW
International Amphitheatre
CHICAGO
March 14-15-16-17
The Fairmont Exhibit of
the world's most complete line of railway motor cars

● Once again Fairmont steps ahead! Two Series of cars—one with *ball*-bearing engines, one with *roller*-bearing engines—make Fairmont, more than ever, the world's most complete line. Many important improvements, assuring increased power, greater accessibility and easier maintenance emphasize Fairmont's leadership in building for outstanding performance. As usual wherever possible, the new refinements are designed for ready adaptability to Fairmont cars already in Service. See the Fairmont exhibit at the N.R.A.A. show! Write for literature! Fairmont Railway Motors, Inc., Fairmont, Minn.

Performance IN THE JOB COUNTS

OF ALL THE CARS IN SERVICE TODAY
MORE THAN HALF ARE FAIRMONTS

NORDBERG POWER TOOLS
for track maintenance

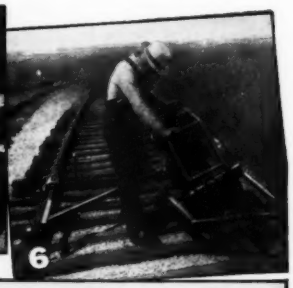
Better quality of track - Faster progress - Less expense

Work will soon get started on many rail laying and track maintenance programs. Never before has it been more essential that a greater amount of better maintained track be secured at the lowest possible expense. This line of Nordberg power driven tools was developed to accomplish this. Every tool was designed to do a specific maintenance job—do it in a way to insure of higher track standards—to finish the job sooner and to keep cost of the work to a minimum.

See our complete display in Booths 143 to 148 at the Railway Show.

NORDBERG MFG. CO.
MILWAUKEE

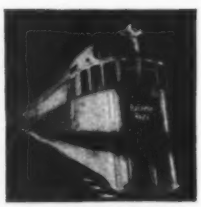
1. Adzing Machine
2. Spike Puller
3. Power Jack
4. Surface Grinder
5. Utility Grinder
6. Precision Grinder
7. Track Wrench
8. Rail Drill
9. Track Shifter



Both TIMKEN BEARING EQUIPPED

Shop Mule manufactured by W. F. Hebard and Co. It is equipped with 12 TIMKEN Bearings; front wheels 4, rear wheels 4, bevel pinion 2 and differential 2.

A symbol of quality for any piece of equipment with which it is associated



8 Budd-built Zephyrs are now rolling on TIMKEN Bearings.
Glide — as you ride a Timken-equipped Train

The advantages of TIMKEN Roller Bearings in railroading are by no means limited to rail units—such as streamlined trains, locomotives, tenders and section cars. They greatly improve the operation of all kinds of modern terminal machinery. A case to the point is the "Shop Mule" pictured beside the Zephyr. It is equipped with 12 TIMKEN Bearings—thus axle wear is prevented, power requirements reduced, lubrication costs lowered and trouble-free operation assured. For modern performance specify TIMKEN Bearings.

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

Manufacturers of TIMKEN Tapered Roller Bearings for automobiles, motor trucks, railroad cars and locomotives and all kinds of industrial machinery; TIMKEN Alloy Steels and Carbon and Alloy Seamless Tubing; TIMKEN Rock Bits; and TIMKEN Fuel Injection Equipment.

TIMKEN
TAPERED ROLLER BEARINGS

HOW TO KEEP TRACKS CLEAR

without INTERRUPTING MAINTENANCE WORK

A-C Model "M" tractor and Baker bulldozer building an unloading platform alongside an Indiana siding. Drawbar is free for switching cars, dragging rails or ties, etc., when not bulldozing.

Compressor unit mounted on an A-C Model "M" working in a mountain cut.

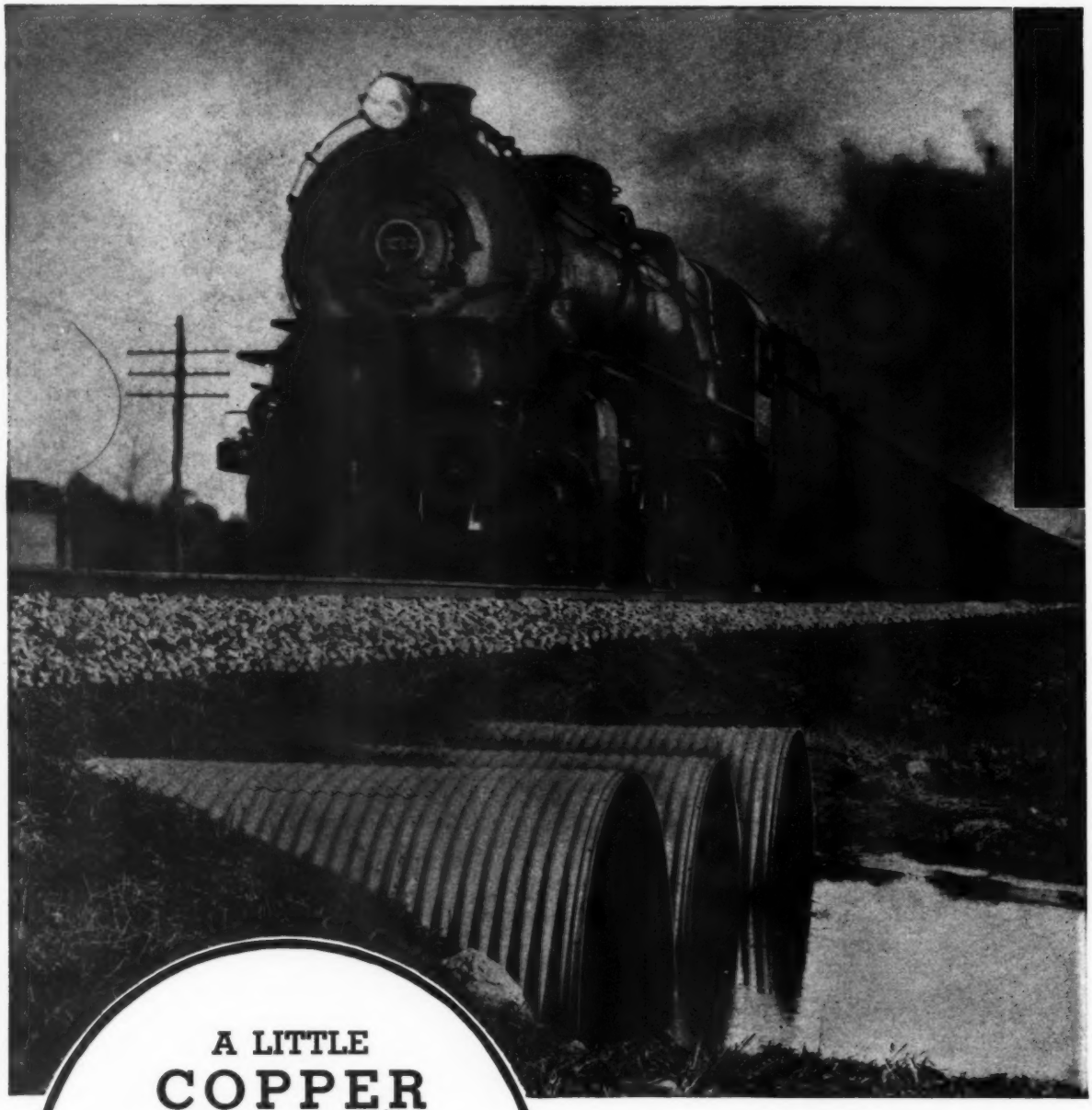
Faster POWER

Put the mobile FASTER POWER of Allis-Chalmers tractors, operating off the tracks, to work handling such varied railway jobs as ditching along right-of-ways, grading for new lines and sidings, laying and dismantling tracks, spreading and levelling ballast, loading and unloading heavy materials, operating compressors and generators, etc. With them no time is lost switching to sidings in order to clear the way for freight and passenger trains. A-C tractors and equipment quickly move off the tracks, are back at work before trains are out of sight. In all weather A-C tractors start instantly. They have more and higher speeds, thus assure you greater flexibility and the right speed for every job. They are geared to give maximum performance in the higher speeds at which you do 90% of your work. Finally, A-C design eliminates speed-robbing deadweight so you get more power per pound of weight and at less cost per horsepower. The result is active FASTER POWER that enables you to get in and out of narrow quarters readily and to work over extremely rough country with ease. Force feed lubrication keeps engine bearings fully oiled on the steepest side slopes. Cut down maintenance interruptions by putting A-C's FASTER POWER on your job.

ALLIS-CHALMERS

TRACTOR DIVISION—MILWAUKEE, U. S. A.

ASK YOUR NEAREST ALLIS-CHALMERS DEALER FOR THE FACTS



A LITTLE COPPER ADDS A LOT OF Protection

A fraction of one per cent of copper added to molten steel considerably lengthens the life of steel when subjected to difficult corrosive conditions. This has been proved by our own tests, as well as the long service of U·S·S Copper Steel Sheets in many fields.

Drainage structures are quickly installed when you use metal culverts. Short-time construction, long-time service—explains why culverts fabricated from U·S·S Copper Steel are so widely used for structures such as this.

Saves Both Time and Money

ON TAMPING, CRIBBING AND ICE BREAKING

● An all year tool . . . Barco Unit Tytamper is fast, efficient and operates at a low hourly cost.

Portable . . . the Barco is on the job and working in just the time it takes the operator to carry the machine to the job and start it. No cumbersome equipment to be transported or set on the right of way.

In spot or gang tamping the Barco Unit Tytamper drives the ballast under the ties with the force necessary to maintain the rails and joints at proper level. Plenty of power for crib-busting. Equally efficient and economical on many winter and summer jobs such as breaking up frozen coal, chipping ice in terminal switches, breaking asphalt, etc.

You are cordially invited to visit the Barco Exhibit, Space 84, at the National Railway Appliance Show in Chicago.

BARCO MANUFACTURING CO.,
1805 W. WINNEMAC AVE., CHICAGO, ILL.

In Canada
The Holden Co., Ltd.
Montreal — Moncton — Toronto — Winnipeg — Vancouver

BARCO
Unit Tytamper

TAMPS HARD BALLAST

IDEAL FOR GANG TAMPING

31 RAILROADS HAVE NOW ORDERED BARCO PORTABLE GASOLINE HAMMER OR UNIT TYTAMPER

✦

Visit the Barco Exhibit, Booth 84, National Railway Appliance Show

LUNDIE TIE PLATE

At Space 49
National Railway
Appliances Association
Exhibit

FOR SAFER TRACK AT LOWER COST

LUNDIE Tie Plates provide a stronger and safer track structure. Their rounded steps of resistance positively hold the rail to gauge without thrust on the spikes, and consequently prevent spreading of the track. The scientifically designed bottom of the plate distributes the load evenly and has no tie destroying projections—an important factor in prolonging tie life.

It is very significant that there are more than 200,000,000 Lundie Tie Plates in service. They are made with single or double shoulders and comply with A.R.E.A. specifications. Lundie Plates provide correct rail inclination so wheels track properly with the result that Lundie plated track rides easier. For greater all-round economy and highest safety, specify Lundie Tie Plates on your next requisition.

THE LUNDIE ENGINEERING CORPORATION

Tie Plates—Spring Rail Clips—Safety Tongs for Handling Track Materials

19 West 50th St., New York **59 E. Van Buren St., Chicago**

NOW...Even Greater Economy In Retaining Wall Design

Armco Bin-Type retaining wall stabilizing railway fill at grade separation. Inset shows how Stringer, Spacer and Column units are joined together by means of connecting channels and bolts.

Greater economy and attractiveness are combined in the Armco Bin-Type Retaining Wall, an improved cellular metal wall built entirely of overlapping units.

The big new feature of the Bin-Type wall is a heavy U-shaped column construction that provides increased strength and stability. The two main units—stringers and spacers—are securely bolted to this rigid column, forming a completely closed bin on all four sides.

Filled with earth or other suitable material, these connected bins function exactly like a gravity retaining wall and offer many economic and structural advantages over other walls. Long life is assured by the use of ARMCO Ingot Iron. Ask the Armco man for complete data. Ingot Iron Railway Products Co., Middletown, Ohio; Berkeley, California. Offices in other principal cities.

ARMCO BIN-TYPE RETAINING WALLS

A PRODUCT ORIGINATED AND DEVELOPED BY ARMCO ENGINEERS

TO RAILWAY SUPPLY MANUFACTURERS

What Railway Men Said

"The publication of this tabulation of work equipment purchases will save me a great deal of time in ascertaining the practices of other roads."—Vice-President.

"When I have a requisition for a special unit of equipment, I will now be able to show my management how many similar units are being purchased by other railways, possibly with less mileage than ours."—Chief Engineer.

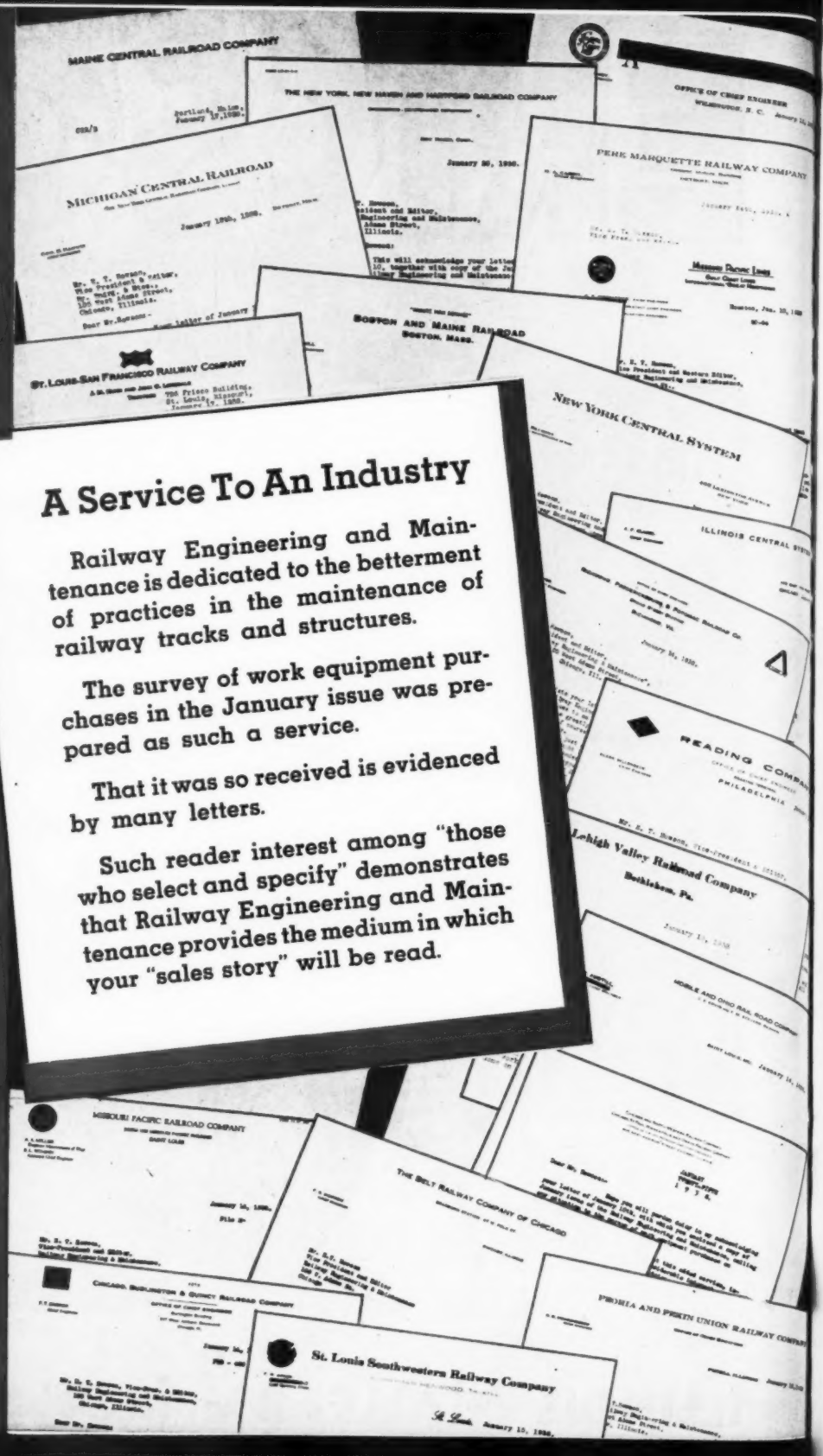
"Prior to your publication of your survey, we have had no exact knowledge regarding work equipment purchases. This information will aid us in comparing what we have bought with the purchases of other railways and may support the use of machines which we do not now have or have not considered."—Chief Engineer.

"The summary of work equipment purchases was of great interest to me in showing the trend and especially the favor with which the new equipment has been received."—Assistant Chief Engineer.

"This survey clearly outlines the increasing use of machines in maintenance of way work and gives a clear picture of what various railways are doing."—Chief Engineer.

"This survey confirms our views as to the trend towards the increasing use of labor-saving devices."—Chief Engineer.

"I have been particularly impressed with the great interest shown in motor cars, tie tampers, power-operated wrenches and drills."—Chief Engineer.



A Service To An Industry

Railway Engineering and Maintenance is dedicated to the betterment of practices in the maintenance of railway tracks and structures.

The survey of work equipment purchases in the January issue was prepared as such a service.

That it was so received is evidenced by many letters.

Such reader interest among "those who select and specify" demonstrates that Railway Engineering and Maintenance provides the medium in which your "sales story" will be read.

RAILWAY ENGINEERING AND MAINTENANCE IS READ BY MAINTENANCE OFFICERS OF ALL RANKS

Duff-Norton Genuine Barrett Single Acting Track Jack No. 117 has a suspended pawl design which eliminates the use of a separate tripping device. Pawl cannot jump out of its bearings as in other Jacks of this type.

Duff-Norton

THE FAVORITE RAILROAD JACKS FOR FIFTY YEARS

Through more than two generations of railroad trackmen, Duff-Norton has been a familiar and trusty tool . . . time-tried and proved as the safest, strongest and longest lasting track jacks obtainable. As a result, you find them faithfully serving on virtually every railroad right of way today, recognized as the railroad standard.

Designed with the one and only genuine Barrett Mechanism and amply reinforced at points of greatest strain, the Duff-Norton Line of Track Jacks represents the finest investment in track tools that money can buy.

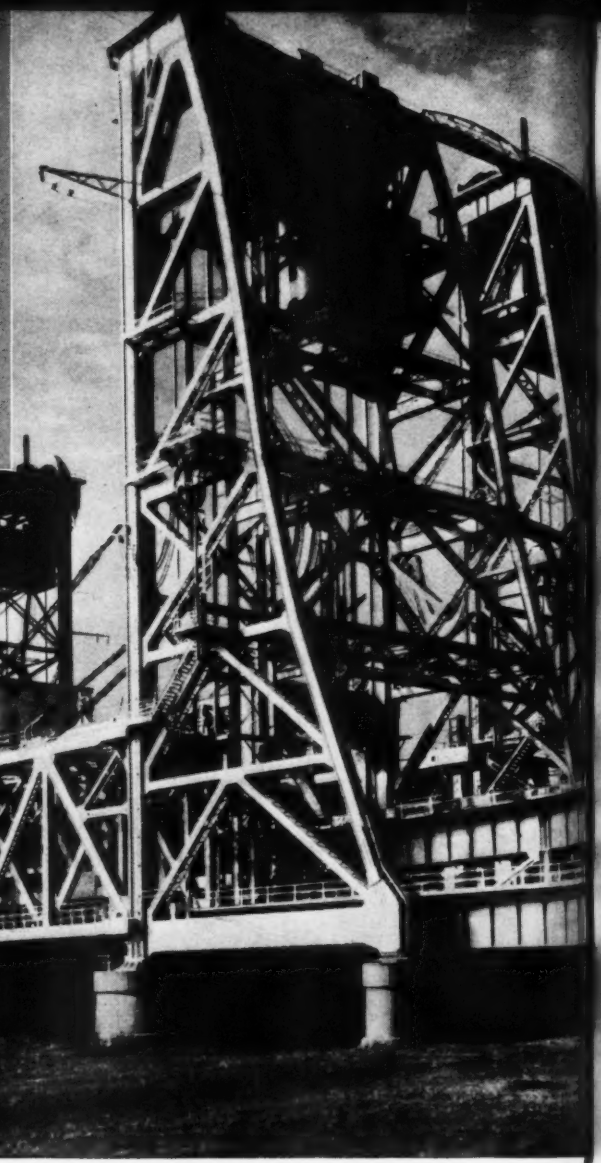
THE DUFF-NORTON MFG. CO.

"The House That Jacks Built"

PITTSBURGH, PA.

THE LOG BOOK READS

"13,500 Lifts in 16 Months"



That's the Job G-E Electric Drive Does on the Nation's Busiest Railroad Lift Spans

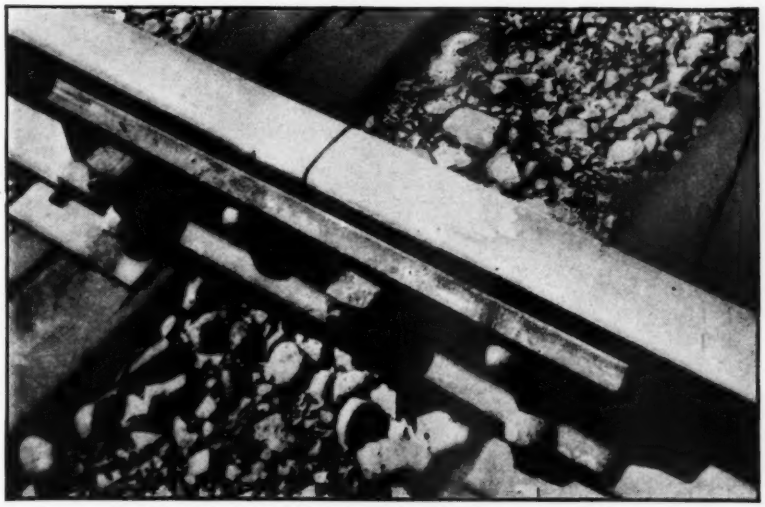
Duplicate motor-generator sets, duplicate frequency changers, and switchgear for operation of the bridge, and for supplying power to Newark station

ONCE an hour and oftener, the three spans of the Pennsylvania's great lift bridges at Newark must be raised to permit traffic on the Passaic River to pass through. This is done in the face of extremely heavy six-track rail traffic across the spans—almost a continuous flow during the busy hours. No wonder, then, that reliability above all else is demanded of the mechanism lifting the spans.

Electric drive was the logical choice for the lifting job—the same drive which has proved so dependable for many other railroad applications. Swiftly, smoothly, and with no delays, this drive does its work—responsive to every touch of the operator in the control tower. And again the confidence of railroads in electric drive has been amply justified.

We are proud to have supplied the main electric units which operate this bridge. General Electric Company, Schenectady, New York.

GENERAL ELECTRIC



Oxweld Procedures for Rebuilding Rail Ends Lengthen the Life of Rail

The building up of battered rail ends was one of the early applications of the oxy-acetylene process to track maintenance. Oxweld procedures for this application have been developed and are applied under the direction of men of wide experience in railroad work. As a result, these procedures represent the most economical and most efficient method of reconditioning rail ends developed to date.

Year after year, the rail ends of thousands of miles of track are restored to original surface by Oxweld methods. The service life of the rail is lengthened, replacements are required less frequently, and track maintenance costs are reduced.

Rebuilding rail ends is one of many time-saving procedures developed by Oxweld in co-operation with American railroads to help them lower railroad operating costs. The Oxweld Railroad Service Company, Unit of Union Carbide and Carbon Corporation, Carbide and Carbon Building, Chicago and New York.

Visit the Oxweld Exhibit
Areas 10 and 12
International Amphitheatre
Chicago

OXWELD
RAILROAD SERVICE
SINCE 1912
OVER A QUARTER CENTURY OF SERVICE
TO THE MAJORITY OF CLASS I RAILROADS

National Railway Appliance
Association Convention
March 14-17

INTERNATIONAL TracTracTors Cut Costs on "Off-Track" Work

The International T-20 TracTracTor cleaning right-of-way with a bulldozer. A wide variety of equipment can be mounted on these powerful crawler tractors.

International TracTracTors will show you something new in efficiency and economy on "off-track" work of all kinds. They provide the flexible power that's needed for cleaning ditches, banks, culverts, and under bridges and trestles; building grades; reshouldering slopes; moving tracks; replacing rails; pulling ties; digging post holes and setting posts; plowing fire breaks, etc.

Year-after-year performance on the job has proved the value of the many features International Harvester has brought to the crawler-tractor field. International Trac-TracTors convert an *exceptionally large percentage* of their engine power into useful work. All vital parts are *completely protected* against entrance of abrasives and water. No matter how thick or penetrating the dust, the oil seals in TracTracTors keep it out. Steering clutches, operating on high-speed shafts, permit *"finger-tip" control* that gives *extra quick* response and *extra ease* of operation. Steering clutches and brakes are *so readily accessible* that they can be inspected, adjusted, or replaced in a minimum of time.

Such things as these are reflected in the cost sheets—they make possible the *economy of operation and maintenance* for which TracTracTors are famous. These crawler tractors are available in five different models, for gasoline and Diesel operation. There also are five wheel tractors in the International line, and power units ranging up to 110 max. h.p. Ask the nearby International dealer or Company-owned branch for complete details.

INTERNATIONAL HARVESTER COMPANY
(INCORPORATED)
180 North Michigan Avenue **Chicago, Illinois**

INTERNATIONAL Industrial Power

A COMBINED SERVICE

That Assures Smooth Riding Track and Economical Maintenance

TELEWELD

Photograph above shows extent of rail end wear before being reconditioned, as shown in unretouched photograph at right, by the TELEWELD process.

Rail End Welding and Hardening

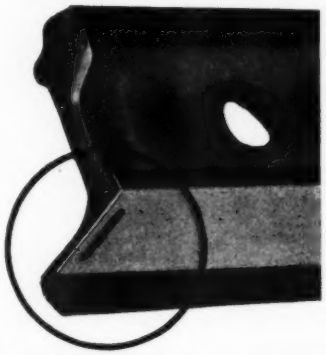
The TELEWELDER offers maximum speed and flexibility—set it off track at one mile intervals—weld a *mile at a time*—no interruptions to traffic.

The TELEWELD pre-heater accurately conditions rail for weld deposits—*controlled cooling* definitely limits and *controls* weld hardness.

The special TELEWELD grinder assures *true,* smooth riding surafce.

Beveling and cross cutting complete the operation.

The complete TELEWELD Process provides reconditioned and heat treated rail ends having wearing qualities superior to original rail.



JOINT BAR SHIMS

Joint Bar Shims Automatically correct all worn areas and restore joint bar efficiency.

Designed to fit under joint bar and over rail base providing a complete new bearing and correcting all worn areas. Low cost but high efficiency.

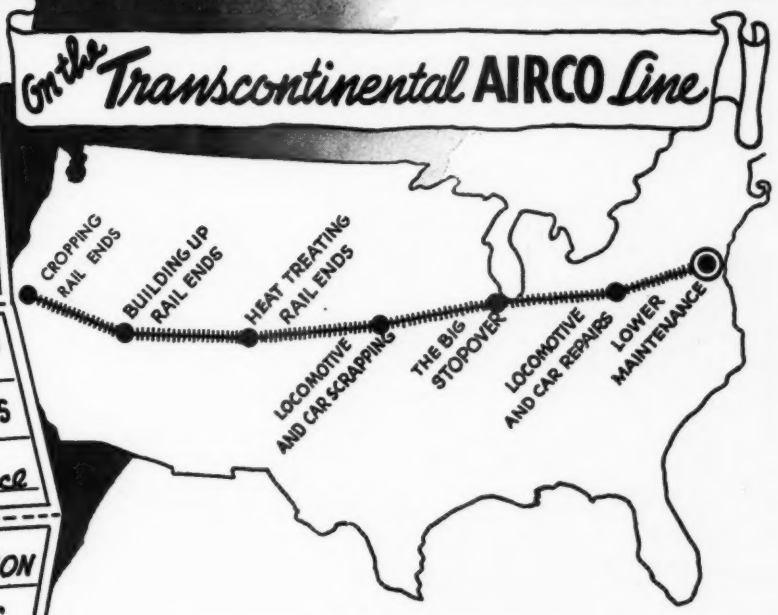
TELEWELD, INCORPORATED

RAILWAY EXCHANGE BUILDING, CHICAGO, BRANCHES IN PRINCIPAL CITIES

New Rail End Hardening—Rail End Restoration—Manual Rail Slotting Equipment—Frog and Switch Reclamation—Steel Bridge Reinforcement; Teleweld Patented Joint Bar Shims—Teleweld Portable Brineller

All aboard! for LOWER MAINTENANCE

On the Transcontinental AIRCO Line



Here's your ticket to Lower Maintenance on the de luxe AIRCO Line—the direct route that gets you there in a hurry from any point in the domain of railway maintenance.

You'll find the service and equipment on this line unsurpassed, and you can count on the fullest cooperation from all hands in making your journey pleasant and profitable.

You can obtain full information about the AIRCO Line to Lower Maintenance from any of AIRCO'S Offices which are located in principal cities throughout the country... or from AIRCO'S Booths Nos. 72 and 74, at the "Big Stopover", the National Railway Appliances Association Exhibition, International Amphitheatre, Chicago... *All aboard!*

AIR REDUCTION
SALES COMPANY

General Offices: 60 East 42nd St.
NEW YORK CITY

DISTRICT OFFICES and DISTRIBUTING STATIONS in PRINCIPAL CITIES

A NATION-WIDE WELDING and CUTTING SUPPLY SERVICE

No. 111 of a series

Railway
Engineering and Maintenance

SIMMONS-BOARDMAN PUBLISHING CORPORATION

105 WEST ADAMS ST.
CHICAGO, ILL.

Subject: Walter S. Lacher

Dear Reader: March 1, 1938

As announced on a following page, Walter S. Lacher has resigned as managing editor of Railway Engineering and Maintenance to accept appointment as secretary of the American Railway Engineering Association, effective at the close of the convention on March 17. This is the last issue in whose production he will participate and terminates a relationship with you, as readers, which antedates the inauguration of Railway Engineering and Maintenance as a separate publication.

Walter Lacher left railway service as a supervising engineer of design on the Milwaukee in May, 1915, to enter the field of railway journalism as an engineering editor on the staff of the Railway Age, devoting his time largely to the Maintenance of Way Section. When this Section emerged as a separate magazine, Railway Engineering and Maintenance, in June, 1916, his duties were enlarged and in April, 1917, he was made managing editor. In this latter capacity he has assumed major responsibility for the constant improvement in the physical appearance of the paper. All through these years he has also carried responsibility for much of the engineering "copy" in the Railway Age.

I know that you share my pleasure at the recognition that has come to Mr. Lacher, for it opens to him an opportunity to render outstanding service to the railway industry in another capacity. At the same time I am sure that you share my regret that the relationship that has existed between you and him is now to be terminated.

In his editorial capacity, Mr. Lacher has demonstrated to an unusual degree the ability to separate the new and the interesting from the routine. Unusually well grounded technically, he was able to detect flaws in the thinking of others and was insistent on technical accuracy in the articles that passed over his desk. He also has a keen sense of proportions, as reflected in the "layouts" of the editorial pages that have come to you. Especially outstanding has been his professional idealism that bred in him a high sense of responsibility to the reader. The question, "Is it in the reader's interest", has been no idle slogan with him. In keeping with this idealism, he has given freely of his time and energy to the work of the various associations in the railway field. He has long been an active member of two committees of the A.R.E.A.; and is now a vice-president of the Bridge and Building Association; a member of the Executive Committee of the Roadmasters Association; and secretary-treasurer of the Maintenance of Way Club of Chicago.

In bidding adieu to Walter Lacher, we introduce you to his successor, Neal D. Howard. Mr. Howard is known to many of you through 11 years' service as eastern editor of Railway Engineering and Maintenance. Mr. Howard is also active in railway association work, being chairman of a subcommittee of the A.R.E.A. and chairman of a committee in the Bridge and Building Association. He is also active in the Roadmasters Association and in the Metropolitan Track Supervisors Club of New York. He comes to the work of managing editor with 13 years' editorial experience, preceded by several years' experience in railway service.

Merwin H. Dick, associate editor at Chicago, is transferring to New York as eastern editor, succeeding Mr. Howard. Mr. Dick entered our organization in 1930 after several years' experience in railway service and is being promoted at this time in recognition of eight years' constructive service as associate and news editor.

Yours sincerely,

Elmer T. Howson

ETH:EW Editor

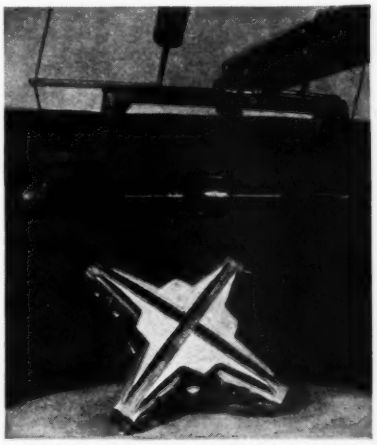
MEMBERS: AUDIT BUREAU OF CIRCULATIONS AND ASSOCIATED BUSINESS PAPERS, INC.

X-RAY Aids in Designing New Crossing . . . . . .

The "Depth Hardened" Crossing is the Result of Many Years of Research

New Design Proved by Field Test and X-Ray Determination

The uncanny ability of the X-ray tube to see through heavy metal has been an important factor in improving the design of AMSCO railroad crossings. The original Solid Manganese Crossing had been very popular because of its safety, simplicity and long life. However, when higher speeds and heavier traffic became common, foundry engineers faced a difficult production problem, for a heavier crossing based on old designs tended to flow and pound down excessively on the receiving surfaces.



A quarter crossing casting for an AMSCO Depth-Hardened Crossing under X-Ray tube for soundness inspection.

The method was adopted of casting pads on the corners of the crossing and then hammering these pads down to surface before installation so as to cold-work the metal and forestall flowing in service, but observation of crossings in track sometimes indicated unsound metal under the surface.

X-ray examination proved that even a light reinforcement in the box-like section under the points and flangeways had a tendency to produce shrinkage cavities, and yet ribs or other supporting members were necessary to prevent fatigue cracking from repeated flexing of the casting under passing trains. It seemed as though the crossing had to obtain the required strength at the expense of proper service wear or else gain metal solidity by sacrificing resistance to flexing.

Many designs were worked out to solve this dilemma, but each time the 400,000 Volt X-ray was able to show up some inherent weakness. Finally, the problem was solved by eliminating ribs entirely from the casting, leaving it underneath in the form of inverted channels which allowed equalized metal sections throughout the casting. The X-ray pictures indicated that a principal cause of unsound metal had been eliminated. AMSCO engineers were then able to fit an anvil accurately on the underside of the casting to protect it while intensively hammering and work-hardening the receiving surfaces. In this way *depth hardness* and anticipation of metal flow were obtained without injury to the casting.

As a final step, to insure sufficient stiffness, a separate flangeway-supporting grid was welded into place underneath the unit after the hammering, making the crossing casting amply hard on the surface and yet strong enough to stand up under the most severe impacts imposed by high speeds and heavy loads. This crossing was developed by American Manganese Steel and Ramapo Divisions of the "Brake Shoe" Company.

The X-ray technique referred to is daily employed by the American Manganese Steel Division of the American Brake Shoe and Foundry Company at its plant at Chicago Heights, Illinois, in checking foundry practice for sounder metal, and in determining designs of greatest merit for a given service.

●

For thirty years railway maintenance men have known that 13% Manganese Steel makes the SAFEST crossing. The new design and process we have described make certain the metal solidity, depth-hardening and body toughness that will not only maintain the safety factor but also assure a crossing with smooth riding, increased life and minimized maintenance cost.

A million tons of traffic weekly pass over two AMSCO Depth-Hardened Crossings in this mainline intersection of the I. H. B. R. R. and the C. & W. I. R. R. at Dolton, Illinois.

WELTRUS HIGHWAY CROSSINGS

● One claim paid for injuries suffered because of a rough, dangerous highway crossing may cost more than dozens or hundreds of Weltrus Highway Crossings. For that reason alone, their cost is justified. But there are additional justifications. ● Truscon Weltrus Crossings accumulate savings in maintenance costs, increase the service life of the track structure by reducing movement between rails and road-bed at highway crossings and contribute to the protection of public relations. ● Truscon Weltrus Crossings completely armor the concrete on both sides and ends. Steel flanges overlap the corners, protecting the edges of the concrete. Weltrus Crossings are made to fit any rail height and all requirements for length can be met exactly. Write for Catalog which contains specifications, construction details, views of installations and other useful data.

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Memorandum: If you visit the exhibition of the National Railway Appliances Association, Chicago, Illinois, March 14, 15 and 16, be sure to see the exhibit of Truscon Weltrus Highway Crossings. Truscon Steel Company exhibit will be in Booths 85, 87 and 89.

Detail of Truscon Weltrus Highway Crossing construction.

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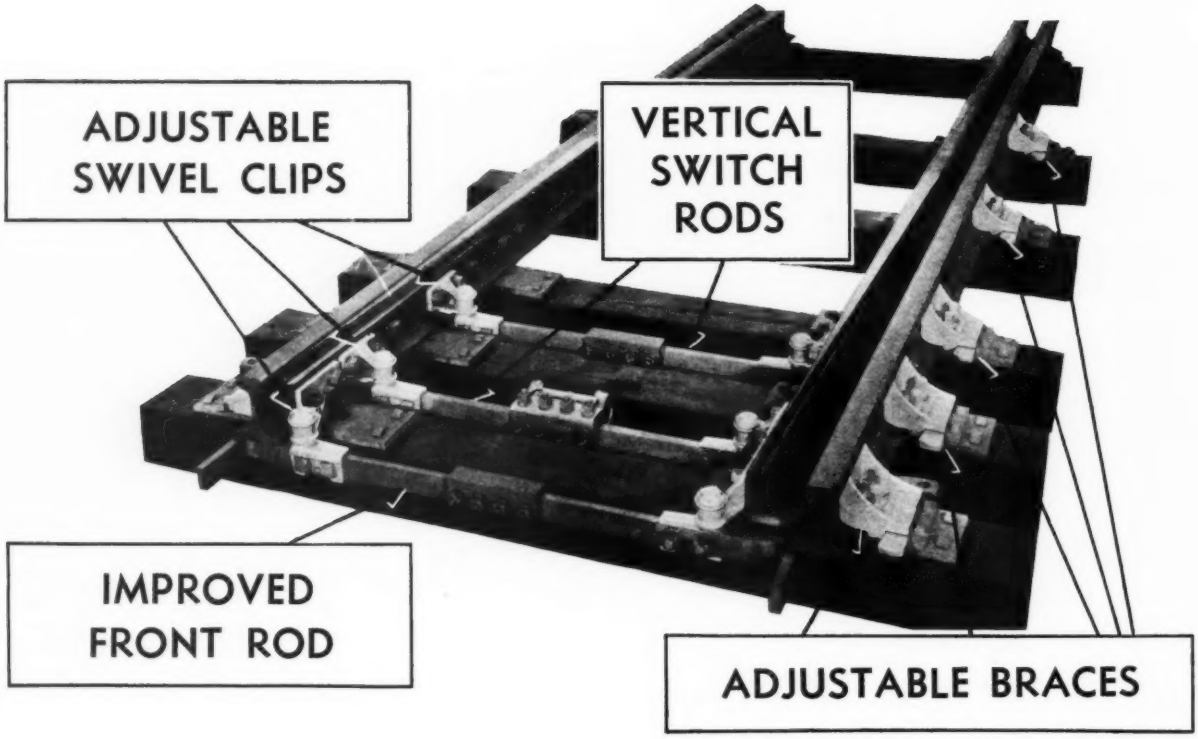
Railway Engineering and Maintenance

NAME REGISTERED U. S. PATENT OFFICE

MARCH, 1938

Mechanically Correct Devices

for Heavy Rail Split Switches



This illustration shows a 16′ 6″ 131 lb. R. E. Turnout Switch equipped with "Cleveland" accessories of improved design.

These devices are already thoroughly service-proven over a considerable period of time. They meet the demands of modern railroading, with its heavier, faster traffic—and heavier, higher rail. They assure maximum safety and minimum maintenance.

See these new switch devices at Spaces 15 and 17 National Railway Appliances Exhibit

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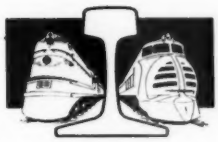
Cleveland **Ohio**

Railway Engineering and Maintenance



Work Equipment

A Development of 20 Years' Standing

THIS issue, in editorial and advertising pages alike, is devoted largely to the application of work equipment to engineering and maintenance of way activities. It differs from other issues in this respect only in degree. In its concentration on this subject, this issue follows a practice of many years' standing, for this is the twentieth year in which the March issue has featured work equipment specifically.

We are featuring work equipment so prominently because of our belief in its present and future importance to efficient railway maintenance. The railways are being pressed more severely today than ever before for economy in every branch of activity. No better evidence need be presented than the fact that more than 30 per cent of the mileage of the country is today in the hands of the courts. Two large properties, one in the East and another in the West, have succumbed since the first of the year. Further, those that are still solvent are in dire straits, as is evidenced by the emergent character of their application for relief through increased rates.

In the face of this desperate financial situation, maintenance forces are facing the necessity today of maintaining their tracks to higher standards than ever before. Passenger trains traveling at super-speeds, and freight trains only slightly slower, place more severe burdens on the track than ever before, while at the same time requiring greater refinements in maintenance.

The Railway Problem

The railways no longer possess a monopoly of transportation services, if they ever did, for they are today confronted with most active competition on all sides and this competition provides a very effective restraint upon their income. Still more broadly, the railways owe an obligation to the public to conduct their operations with the maximum economy, for in a country of such large distances, the potential markets of industries are limited largely by transportation costs.

For all these various reasons railway managements are confronted with the necessity for reducing their transportation costs to the absolute minimum, consistent with efficient operation. To the extent that maintenance costs contribute to transportation expenses, the officers of this branch of railway service bear the same responsibility. To the extent that work equipment contributes to the reduction of these costs, its widest possible application is imperative.

Employees Benefit Also

But the benefits of work equipment do not accrue solely to the railroads as employers. Many benefits accrue also to the employees. From its very nature much maintenance of way work is arduous, frequently verging on drudgery. Much of the equipment that has been developed removes all or a large part of the drugery from these tasks. The replacement of the hand car with the motor car constitutes such an example.

Furthermore, much of the equipment eliminates or reduces the hazards inherent to hand operations and contributes directly to the reduction in injuries among employees. Such results have come from the replacement of tong men with cranes in laying rail and from the substitution of power adzing machines for hand tools.

In still another direction the use of work equipment results to the benefit of the employees. This is the increased compensation that is made possible thereby. It is a fundamental law of economics that employees in any industry cannot long take from that industry more than they produce. It is equally axiomatic that as the output or production of employees increases they are able to command a larger return for themselves. This argument is utilized by spokesmen for labor and was set forth by them in advocacy of increased compensation for maintenance of way employees last year.

In utilizing work equipment for many maintenance operations, the railways are pioneering in detail only with respect to the development of particular machines for specific tasks. In the broader phases, they are following in the wake of a trend that is as wide as all industry. We are in a machine age whether we like it or not. The trend is irresistible. The transportation industry can do no other than follow suit.

With the acceptance of a trend that is as revolutionary as that involved in the acceptance of many types of work equipment, it is not surprising that drastic changes in organization and in methods of working should be necessitated. These changes call for the modernization of many practices and of much of our thinking. The articles that follow are designed to stimulate thinking—in the search for the solution of some of the more pressing problems, and to portray also the extent to which some of the roads

have progressed in the utilization of work equipment.

The rapidity with which the railways as a whole are accepting work equipment today is shown by the fact that they spent more than $5,000,000 last year for the purchase of new equipment while the total investment that they have made in this equipment to date is many times that amount. Yet the utilization of this equipment is still in its infancy. Few roads are yet adequately equipped with any one unit. Few units have been accepted fully on other than a relatively few of the more progressive roads. Many needs are as yet largely or entirely unmet.

Work equipment is bringing to the railways increased output, a better quality of work, and lower costs. It is likewise bringing to the employees relief from drudgery, increased safety, and added compensation. Equally important, it is aiding the railways in giving the American public the most efficient transportation service in their history. *Railway Engineering and Maintenance* accepts as its responsibility in the furtherance of this objective the task of disseminating information regarding the progress that is being made currently and of aiding in the stimulation of thought looking to the more universal acceptance of these developments as they appear.

This is an age of progress. Nowhere is this progress more active today than in the railway industry. Nowhere in the railway industry should it be more active than in the maintenance of way department.

Off-Track Equipment

Finds Many Applications

THE day of "off-track" work equipment, usually with crawler-tread mounting, has definitely arrived. Partly as the result of the increased attention which has been given to the development of this equipment in recent years, and partly due to the change in character of train operation in many parts of the country, many roads today are carrying out a wide variety of maintenance operations entirely independent of the track.

Only a few years ago, it was thought that heavy ditching and cut widening had to be done from the track and that almost every heavy unit of work equipment had to be mounted on flanged wheels. With a smooth roadway of steel rails at hand, this was not an illogical thought and can still be defended as desirable and economical under many conditions. But with the development of the modern crawler tread during the world war, and its subsequent adaptation to many classes of construction machinery, it was not to be expected that its advantages for carrying work equipment along the right of way would be long overlooked, particularly where intensive or high-speed train operation was involved or where only ordinary train operation caused long and costly delays to work operations.

Today, "off-track" equipment can be secured for almost every important track maintenance operation, crawler mountings being available for practically all of the heavier units of equipment, including power shovels, cranes, draglines, spreaders, graders, air compressors, arc welding machines and mowing machines, with the tendency definitely toward further application of crawler or equally effective treads to other types of equipment which are not of necessity required to work directly over the face of the track.

Where track-mounted equipment interferes seriously with train operation, or is itself interfered with by train operation, causing costly delays to work while clearing the track, it is only logical that off-track equipment will find a place. Where this latter type of equipment increases the safety of train operation, eliminates work train and flagging expense and proves more effective in carrying out operations, its ultimate adoption on an increasing scale is assured.

Power Equipment

Nowhere Near Enough

TO the majority of maintenance men who read the above head, regardless of the character of their particular responsibilities, the roadway or track department will almost instinctively come to mind. Many bridge and building department men may even pass these comments by with the thought that they have to do solely with track department equipment. And well they might refer to such equipment, because many roads are short of equipment that could be used to advantage and with large economy by the track forces. But the thought here has to do primarily with the bridge and building forces, forces which have been long neglected on many roads.

Throughout the years of the depression the major attention of maintenance officers has been directed to the track structure and to ways in which it could be maintained in the best possible condition with the least expenditure of funds. As a result, marked stimulus has been given to the use of track power tools and equipment, without which few, if any, would contend that the tracks of the railways generally would be in the favorable condition that they are today. While this has been a healthy condition as far as the track department is concerned, it has had a tendency on many roads to relegate further to the background the needs of the bridge and building forces, with the oversight of potential economies there of large magnitude.

Too often, with the knowledge that the bridge and building forces have available a crane or two, a few concrete mixers, and an air compressor or an electric generator and a few power tools for use on the larger jobs, the problems of these forces have been subordinated to what may have appeared to be problems of greater importance, and the bridge and building forces have been allowed to "whittle" away as best they could.

Only a few years back, a building foreman said to his supervisor, "Do you realize that there are approximately 12,000 lineal feet of sawing to be done on this job. Is there any way by which we can get a portable power saw to do this work?" There was more than two miles of crosscutting and ripping in ¾-in. to 3-in. stock. The saw required would have cost approximately $85. It would have more than paid for itself on this job alone, and many times since, but the last board on the job was cut with a handsaw. And what happened here is still

happening on many roads as the handsaw "bucks" its way through miles of timber and the wimble cuts its way laboriously for thousands upon thousands of bolt or lag spike holes, from one-sixth or one-eighth as fast as is possible with modern power-driven tools.

That some roads have been giving increased attention to securing greater efficiency from their bridge and building forces through providing them with suitable power tools to carry out their work is evidenced in the article in this issue entitled, "Backing Up the Bridge and Building Forces," wherein there may be a thought or two of value to other roads.

Gasoline Engines

What Kind of Fuel and Oil?

ONE of the fundamental requirements of economical and satisfactory gasoline engine performance and minimum maintenance costs, that is known to even the embryo mechanic and engine operator if not to every layman, is high quality fuel and lubricating oil. Whether it is for an automobile, a motor truck, a gasoline-operated shovel, a tie tamper compressor or any one of the numerous types of gasoline-engine operated units of work equipment employed by the maintenance of way department forces, the qualities of the fuel and of the lubricating oil have an important bearing upon performance and repair costs. And this becomes particularly so with the high compression engines and the closer design tolerances that are coming into more general use.

High-quality fuel and oil bring about easy starting, smooth running, maximum power, minimum running repairs, minimum wear of parts and infrequent overhauling, while the use of gasoline and oil of poor quality, on the other hand, result not only in difficult starting, loss of power and frequent repairs and overhauling, but, in maintenance of way work, all of the losses in gang performance which follow faulty or disabled equipment, losses which can readily assume large proportions where many men are involved.

The average railway officer would not think of using inferior gasoline or oil in his own automobile because he knows that he will get less power and fewer miles per gallon, while at the same time running up repair costs, if not actually damaging his engine. If thus justly concerned about his own automobile engine, he should be equally concerned about the many, in some cases hundreds of gasoline engines under his direction in maintenance work.

If he doubts the equal importance of good-quality fuel and oil for these units, let him ask those in direct charge of the operation and maintenance on his road. If they have been getting inferior fuel and lubricants, they will tell him of faulty operation; of excessive field repairs; of whole gangs of men delayed or brought to a standstill because of engine failures; of unnecessarily frequent and costly overhauling; all the direct result of the quality of fuel and lubricants used.

The railways are large users of both gasoline and lubricating oils, which makes a saving of a few cents a gallon bulk large on a year's requirements—a great temptation to those in charge of purchases. But if this saving is made at the expense of quality, the saving is an illusion and may be far out-balanced by increased equipment operating and maintenance charges. Where there is any possibility that this situation exists, it is not only to the interest of maintenance department men to bring this matter to the attention of those responsible for the purchase of fuels and oils, but it is their duty in the interest of minimum over-all costs to their railways.

Obsolescence

Does It Pay to Ignore It?

GREATLY to their credit, maintenance officers are constantly striving for greater economy in the conduct of their work, and they cannot be commended too highly for what they have accomplished in this respect. In fact, in the face of rising prices for both materials and labor and despite the many adverse decisions of the National Railroad Adjustment Board which have added to their costs without corresponding benefits of better work or greater production, they have been able so far to keep the curve of cost pointing downward. How much further they can go in this direction is debatable, unless means as yet untried can be found, which will open up new channels leading toward economy.

That such means are available and can be utilized easily with the certainty of producing the desired results in a large number of cases, will doubtless come as a surprise to many of these officers who believe that they have already weighed all of the major possibilities for further savings. As pointed out in a discussion on obsolescence on a later page, many of the power units now in use are economically unfit for further service, not alone because of their physical condition, but by reason of the fact that they cannot compete successfully on a profit basis with more modern designs or later types, because of the higher efficiency of the latter.

This is not intended as a criticism, for maintenance officers have had little opportunity to study obsolescence and its blighting effects on their operations. Originally, hard put to obtain enough work equipment to keep their major projects going; then, suddenly, faced with an almost total collapse of their numerous activities, followed by a surplus of power machine for which they had no use, it is only in the last two years that they have begun to add to the equipment they already possess.

While it is conceded that additional power machines are needed, and that in some cases the need is severe, there is an equal need for a thorough study of the operation of every unit of work equipment now in use, and for a comparison of the results of this operation with those of more modern designs to determine their relative economy. This comparison should be placed squarely on a profit and loss basis, with the officer who makes the investigation assuming the role of a contractor whose financial success depends on how much profit he can make, and then asking himself how much profit can be made with the machine of newer design, and how much will be lost by keeping the old machine in service. If the investigation is made on this basis it is safe to say that the results will contain many surprises.

Where Are We Heading

In the Use of Work Equipment

Rail Laying Operations Are Fully Mechanized on Many Roads

ONE of the outstanding developments in railway maintenance today is the rapidity with which work equipment is coming to the aid of the forces engaged in this work. Interest increases when it is considered that the well-defined use of power machines had its beginning, for practical purposes, as recently as 20 years ago, and that during most of the last half of this period maintenance activities were so sharply restricted that for several years purchases of work equipment declined almost to the vanishing point.

A New Concept

There are many indications that these lean years have definitely crystallized the thinking of maintenance officers with respect to the utilization of work equipment, and have created a new concept of its possibilities and of the objectives that can be attained through its use. The original viewpoint was that it eased the burden of labor. As experience was gained in its use, the prevailing thought was that more work could be done in less time, this concept of the advantage inherent in the use of work equipment being stimulated by the fact that both construction and maintenance activities were approaching a peak. This was followed closely by recognition that many tasks can be done better with power machines than by hand and that some tasks that are impracticable by manual methods can be done easily with power equipment.

Following the economic collapse of 1929, a complete re-orientation of attitude with respect to work equipment materialized. Reflection showed that the previous viewpoints had not been wrong, for work equipment properly used possesses all of the advantages which had been attributed to it. On the other hand, the new conditions that have arisen have shown that while it possesses a number of other advantages, depending on the type of equipment and the character of the work to which it is assigned, it is becoming imperative that economic justification be established for the purchase of new units and for the continued use of those already on hand.

What Are the Trends?

For these reasons, it becomes of interest to study the number and types of units purchased recently, the roads making these purchases and the classes of work for which they are intended, to determine whether they reveal any trends and, if so, what they imply. The list of units purchased in 1937, which was published in the January issue, provides an excellent basis for this study, since it constitutes the first measure ever attempted to determine the extent of the purchase of this equipment. This compilation includes information received from 533 individual roads, large and small, or 82 per cent of all of the railways of the United States, Canada and Mexico, including all but one of the Class I roads.

In studying this tabulation the magnitude of the purchases is first noted, for 3,310 units were purchased by the roads reporting. It is of equal interest to examine the purchases of individual roads, for nine of them reported from 103 to 270 units, with a number of others only slightly below 100. This is all the more impressive when it is considered that most of them also made substantial purchases of work equipment in 1936.

Purchases Concentrated

This study also leads to the disclosure that as yet the use of work equipment is highly concentrated, for 41 Class I roads and 373 of the remaining classes, a total of 414, or 78 per cent of those reporting, stated that they made no purchases of work equipment in 1937, while 78 Class I roads and 41 others, or 22 per cent, reported that they had bought such equipment during the year. This fact indicates clearly that there is still an extensive field in which the use of work equipment has not yet been developed. Further study makes it apparent that those roads that already possess sizable complements of power machines were among the largest purchasers of new equipment during the year, demonstrating that their experience has proved its economic value in maintenance so conclusively that they are able to justify additional purchases.

Despite this evident concentration in purchase of work equipment, one

cannot fail to discern a broad expanding use of power equipment, not only on those roads that are more experienced in its use, but on roads that have as yet made little use of it, as well as on certain others that have heretofore believed that they could not justify its use. Among the indications of this wider use, not a few roads purchased additional units of types already in use, while many of them included units of types they had not used previously. It is also an illuminating commentary on the trend toward a wider use of work equipment, that some of the poorest roads were among those that bought most largely, indicating that the officers of those roads that must watch their expenses most closely recognize that the use of work equipment is the door to economy.

This trend toward a wider use of work equipment is also seen in the number of units purchased by many roads, of types which have only recently become available and of others which, although previously available, have only of late been considered as adapted for maintenance operations, as well as in new uses to which some types are being put. These adaptations stand out all the more clearly by reason of the necessity, in some instances, for revising practices of long standing to make the utilization or new uses of these types practical.

Among the newer types of equipment which are receiving wide acceptance are adzing machines, of which 60 were reported as purchased last year, because they have demonstrated their effectiveness, not only from the standpoint of economy, but also from that of superiority to handwork in the results they attain. Bolt tighteners represent a slightly different type of equipment that has become available even more recently, in that they have brought about a definite change in maintenance practices. While the use of adzing machines is as yet confined almost exclusively to rail gangs, and while bolt tighteners were first used in this service, their use is being extended rapidly to include ordinary maintenance. As they are being used in this latter service they require the organization of special bolting gangs which relieve the section forces of this routine item of work formerly assigned to them.

Equipment for electrical welding is an example of another type that has only recently become available commercially, the use of which is expanding. While notable advances in the art of welding have been made in the last few years, the application of electric welding to maintenance has been restricted largely by the lack of portability of the equipment, so that its use by the railways, mainly for building up worn and damaged manganese steel frogs and crossings and for structural welding, is still in its infancy. Since as recently as five years ago, the number of roads owning electric welding equipment for use by the maintenance of way department could almost be counted on the fingers of one hand, the fact that the 1937 budgets included 29 welding outfits points definitely to a widening use of this equipment.

Viewpoint Is Changing

No more startling evidence of the changing viewpoint of maintenance officers with respect to the use of work equipment, or of their readiness to substitute new practices which they are convinced are better than those they have been following, can be adduced than that 108 motor trucks were purchased in 1937. This item stands out more prominently because this is a type of equipment that, although available, has not been utilized in maintenance until recently. In fact, as recently as 1930 a committee reported to the Roadmasters' Association that while motor trucks could be used to advantage in large congested terminals, and were being used extensively in such areas by the stores department, they were of small advantage elsewhere, and that only a negligible number were being operated by the maintenance of way department. This changing viewpoint of maintenance officers and the trend toward a wider use of motor trucks stand out more clearly when it is realized that many of the units purchased in 1937 were intended specifically for service out on the line.

Purchases Diversified

Again, one cannot fail to be impressed by the diversity of purchases made by the 119 roads under consideration, for they include 103 different types of equipment, ranging in size from pile drivers, locomotive cranes, tractors and motor trucks, to portable power-driven hand tools, such as drills, wood borers, saws and wrenches. In addition to this diversity of types, many of the individual types represented several different designs. A further differentiation also occurs by reason of the fact that some are driven, either directly or indirectly, from internal combustion engines, while others are operated by electricity.

Seeking a little further, it becomes obvious that this diversity in types is another indication of the changing viewpoint with respect to work equipment, and to the economies that can be effected by its use, and of expansion in the use of power-operated equipment, for only a few years ago maintenance officers gave little thought to the possibilities inherent in power machines beyond their ability to perform the larger and heavier tasks with which their forces were faced. As a consequence their work-equipment budgets were then limited to steam shovels, locomotive cranes, rail-bound ditchers, large tie-tamping outfits and similar equipment.

Even a casual study of the list of equipment purchased in 1937 will confirm the profound changes that are taking place in the attitude of maintenance officers toward work equipment and the consequent expansion of its use, for while there is still a definite demand for the heavier types and large outfits, except steam shovels, the budgets now include many smaller items which are intended to expedite the work of the individual rather than to relieve him from a heavy burden, as the rail crane does, for instance. This is exemplified by the number of small tools purchased for individual use, such as timber borers, clay diggers, chippers, scratch brushes, drills, pick hammers, paint sprays, saws, etc.

Still further confirmation of the

(Continued on page 177)

More Attention is Being Given To Equipping B. & B. Forces Properly

It Is Pertinent to Consider the Effect that Machines Have Had on Maintenance Practices and Gang Organization

The Specialized Gang—

What Is Its Justification?

EVIDENCE that the railways are committed to the use of work equipment in maintenance can be seen on every hand. That they can not now return to the methods in vogue prior to the introduction of work equipment, even if they desired to do so, is apparent to any one familiar with today's demands for high standards of maintenance and with the ways in which these demands must be met. Yet the introduction of power machines into maintenance is so recent, and the expansion of their use has been so rapid that it is pertinent to inquire concerning the effect they have had on maintenance practices, the changes that have occurred in gang organization as a result of their use and the present trends with respect to the use of work equipment.

In general, customs and habits of thought change slowly. Yet, because the use of work equipment has expanded, and is continuing to expand, so rapidly, the development of methods for using it could not follow the slow and halting course of progress as it usually occurs in other fields, but of necessity has had to keep pace with the requirements of this expanding use. However, old ideas with respect to organization and methods of doing work were not always given up without a struggle, and this persistence of the former point of view has sometimes retarded expansion of the use of work equipment, while in not a few instances it has had a definite influence on the manner in which it has been used. Again, it has occurred that after some type of equipment has gained wide acceptance, improvements have been made or some other type has become available, that have called for a further reorganization of the forces and sometimes for a complete revision of methods.

What Are the Trends?

In view of the relatively short period of transition from manual methods to power machines and the far-reaching changes in maintenance practices that have resulted, and having in mind the wide variety of conditions under which railway maintenance must be conducted, including variations in climate, topography, soil, and traffic, the tendency toward the growth of local practices and the differences of outlook among maintenance officers, one might expect correspondingly wide variations of practices in the use of work equipment and in the form of the organizations by which it is used. The astonishing fact is, however, that despite considerable variation in the details of both organizations and methods to adapt the use of the equipment to local conditions, the basic features of this use vary within surprisingly narrow limits.

When one considers the drastic changes in organization and practices that were necessary to adapt power machines to maintenance, it becomes of interest to trace some of these changes and from them study the present trends, for in many instances practices have by no means crystallized as yet, but are still in the process of development, although certain recognizable patterns are emerging. One reason for this

situation, which has characterized the use of work equipment from the beginning, has been the constant improvement of existing machines and the development from time to time of new types, both of which have tended to require changes in organization and methods. Again, not a few maintenance officers have tried to adapt the use of the machines to established methods rather than to adopt methods more in accord with the requirements of the machines, thus lowering the effectiveness of the equipment and retarding the expansion of its use.

Specialized Gangs

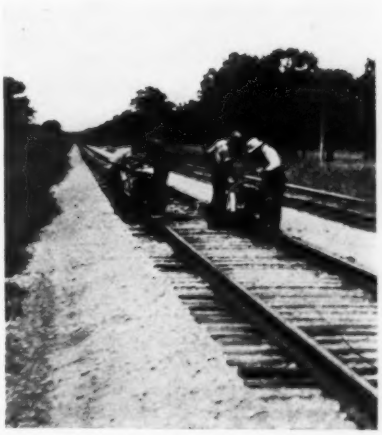
Despite all of these cross currents and retarding obstructions, certain well-developed trends are apparent, one of which is the general movement toward the employment of specialized gangs. As recently as two decades ago it was not uncommon to organize an extra gang which, in a single season, might be engaged in laying rail, ballasting the new rail, surfacing elsewhere, ditching, widening embankments and other classes of work as the need arose. In contrast, today's gangs are being organized for specific tasks and each is equipped with power tools adapted for the particular class of work to which it is to be assigned, to the exclusion of all others. It is of interest, therefore, to study this trend and learn how the various types of equipment are being used and the form of organization that has been developed for their use.

In some cases, machines have been designed with certain specific applications in mind, and maintenance officers have been slow to realize that they possessed possibilities for wider applications. It has also happened that after these possibilities were appreciated, the use of the equipment expanded with surprising rapidity. Bolt tighteners provide a case in point, for they were designed for a specific application that now represents only a part of their present wide range of usefulness. This equipment was first used to tighten bolts on newly laid rail, and later this use was expanded to include the stripping of bolts to uncouple the old rail in advance of the rail gang. As the next step, one road organized a system gang equipped with bolt tighteners to relieve the section forces of this task of routine maintenance. Tightening bolts, like renewing ties, had always been considered the work of the section gang, and so tenacious are established practices that it was several years before other roads began to recognize the advantages of using bolt tighteners in routine maintenance.

Once these advantages were appreciated, however, the practice spread rapidly until today special gangs, organized on either a system or division basis, fully equipped with bolt tighteners, are being assigned to cover a sufficient mileage to keep the machines occupied throughout the working season.

Rail Gangs Highly Specialized

For laying rail another form of specialized gang has been developed. In tightening bolts in routine maintenance, only one operation is performed, while in laying rail there are several, each of which has come to be considered a specialty in itself. For this reason it is of interest to follow the slower development of the rail gang as it has passed from manual methods to full mechanization. Originally, rail gangs consisted ordinarily of 25 to 75 men, which were organized as division gangs, and the rail was laid in three cycles, that is, the preparatory work, the actual laying and completion of the bolting and spiking after closure. The men were expected to perform any of the many tasks required in laying rail, and during the progress of the work they were generally called on to take a turn at all of them. As soon as the rail was laid, the gang was usually turned back to do the ballasting, after which it might be disbanded, assigned to ditching or used to complete other work.



In Tightening Bolts in Routine Maintenance Only One Operation Is Performed

Introduction of the rail crane increased the speed of laying to such an extent that a much larger force became necessary to avoid delaying the placement of the rail, so that in many instances the gang became unreasonably large, out of balance and somewhat unwieldy. Development of the tie adzer, the spike puller, the bolting machine and the spike driver have tended to reduce the number of men required in the preparatory work as well as those engaged in fastening the new rail, with the result that today's rail gang of 160 to 175 men is far better balanced than it could possibly be under manual or partly manual methods. Again,

The Mechanized Surfacing Gang Is Organized So That All Operations Move Forward Continuously at a Uniform Rate

each task is performed by a self-contained unit which progresses at the same rate as all other units in the gang, the work thus being performed in a single cycle.

Utilization of power equipment has had another very definite effect on the practices connected with laying rail. When rail was laid by hand, every division organized its own rail gang and disbanded it or assigned it to other work when the rail was laid. No road can afford to equip every division with power machines for laying rail, which would be lying idle most of the year. However, by placing these machines in the hands of a few specialized gangs they can be used for a sufficient time during the year to show a satisfactory profit on their ownership and operation. Another advantage in the use of specialized gangs for laying rail is that the men are not shifted from one task to another at short intervals and, therefore, become expert in the job to which they are assigned, thus increasing the output per man-hour without increasing the effort.

Contrasts in Ditching

Only a few years ago when a division had any considerable volume of ditching to do it organized a gang of two to three hundred men, ordered a work train with flat cars, a lidgerwood and an unloading plow. When the steam ditcher became available, the day of the large ditching gang was over, since only a relatively few men were required to trim up after the shovel, handle the unloading and trim the shoulder of the embankment. With the advent of the crawler-mounted dragline the service of a work train was no longer necessary and the gang was reorganized in accordance with the demands of the new type of equipment. Today, the dragline, the power shovel and the tractor, all on crawler mountings, vie with each other in popularity for ditching as well as for many forms of grading, each requiring a special organization.

In striking contrast with the humming activity of a ditching gang in the era of the hand shovel, a crawler-mounted tractor equipped with a front-end loader or a bulldozer and, on occasion, with a road grader, with one operator and a helper and with no need for a work train, will clean many miles of ditches during a season at only a fraction of the former cost. Tractors equipped with bulldozers have been used with equal success for widening light embankments, the force in this instance being the same as for ditching. Obviously, where a considerable volume of earth must be moved or it must be hauled for a considerable distance, the power shovel or dragline will be employed. As these three off-track types are used today, however, they call for a high degree of specialization on the part of the forces engaged in their operation.

Tie Tampers Another Example

Tie tampers comprise another type of equipment that has brought about a high degree of specialization in gang organization, compared particularly with the general utility extra gang that was so common less than a generation ago, but which is passing because it cannot compete in quality of work or economy of performance with gangs that are fully equipped with power tools and assigned to a single class of work. The present trend for ballasting and for general surfacing without renewing the ballast, is to equip a gang with a power jack and a tie-tamping outfit of sufficient size, say 12, 16 or 24 tools, and organize it on the same principle as the rail gang, that is, so that all operations from spacing and renewing ties to dressing the ballast section and giving the track its final line, will move forward continuously at a uniform rate.

Perhaps no other maintenance activity has resulted in a greater degree of segregation into specialized work than that of welding and heat treating rails, frogs, crossings, etc. This work, whether done by gas or electricity, is in no way related to other forms of maintenance and the equipment for both welding and grinding has no utility beyond the rehabilitation work for which it is designed. For these reasons, welding gangs do not represent an evolution from some previous gang organization, but a new development in specialized gangs, since they came into existence simultaneously with the advent of the advent of the welding equipment.

References Are Inclusive

Although the references that have been made represent only a small part of the maintenance activities on any road, they are inclusive enough to be typical of what is occurring on all roads in connection with the use of work equipment. They indicate a definite trend toward the use of specialized gangs that are fully equipped with power machines and tools of types that are adapted for the work to which these gangs are assigned. It is of interest, therefore, to inquire why the specialized gang has found such widespread favor and why the older general utility extra gang is passing.

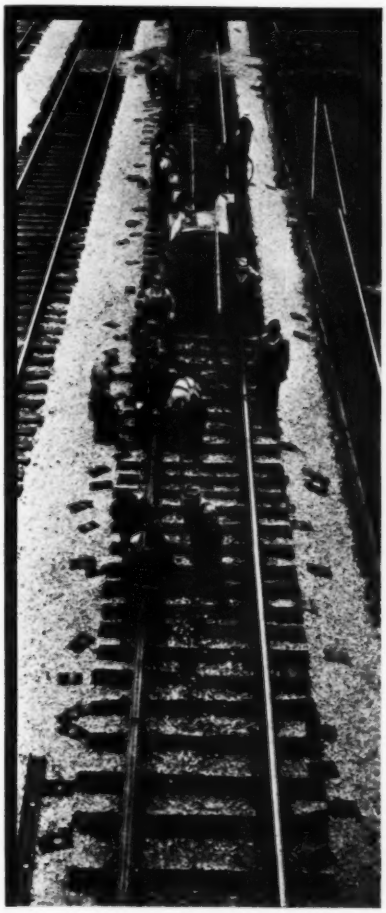
In the first place it costs money merely to own a power machine or power tool, for overhead charges, including interest and depreciation, must be accepted, whether the equipment lies idle or is kept busy. Again, by reason of the character of the work upon which it is engaged, the economical service life of power equipment in maintenance is short while, because designs are being improved constantly, obsolescence takes a heavy toll. For these reasons, the charge for depreciation must be ample to cover both physical deterioration and obsolescence.

Work equipment is employed only because it will do the work more economically than it can be done without it. Obviously, therefore, there is no point in owning a power machine unless it is able to show a profit. This can be done only when the accumulated savings which result from its use are greater than the sum of all charges, including overhead, repairs and operation.

The Justification

These are among the reasons why the specialized gang has found so much favor among maintenance officers. A gang that is constantly transferred from one class of work to another cannot be expected to use any of the equipment assigned to it for a sufficient time to earn the maximum profit on it, or in many cases even to wipe out the fixed charges. On the other hand, because it sticks to one kind of work, the specialized gang is able to keep the equipment in active service for a sufficient time to earn the necessary profit. Besides this, by keeping at one kind of work, the members of the gang become expert in their tasks and increase their output without increasing their effort, thus adding to the advantage of the specialized gang.

On some roads the use of specialized gangs was started in the first instance primarily because they were too poor to equip more than one or two gangs with the machines necessary for any class of work. On others, this same development occurred because there was not enough work of any class available for more than one or two gangs; on still others it was a matter of keeping down slow orders, of delivering material or of concentrating on certain districts or divisions. Whatever may have been the original cause of the development, the specialized gang has shown such economic advantages that it has become a permanent institution for many phases of railway maintenance.



Making Work Equipment Work

How the railways are organizing to administer their power appliances to insure maximum utilization

IT IS not so many years since the only requisite for a well organized maintenance of way department was an adequate complement of qualified foremen and supervisors. If these men possessed well-rounded experience and were endowed with native leadership, they could carry on the work of the department with little supervision from their superior officers other than such as was necessary to assure that they measured up to their responsibilities and that the funds available for the upkeep of the property were distributed on an equitable basis.

Must Earn Their Keep .

But times have changed. The advent of power tools and the expansion of the use of work equipment have introduced a wide variety of administrative problems that did not concern the system maintenance officer of earlier days.

During the period of development in the use of power tools, maintenance officers were concerned primarily with the quality of the work done, the most efficient methods of operation and the experimentation that was necessary for the perfection of the equipment. But as more appliances have come into the possession of the railroads, those who are responsible for their acquisition have been confronted with the task of earning a return on what has rapidly become a sizable investment. Power tools are not only more costly than picks, shovels, saws and cant hooks, but by their very nature many of them can perform only one specific task. The need for keeping them profitably employed is, therefore, not only more urgent, but also more difficult.

The answer to this problem was not obtained over night. It has been arrived at through a process of evolution in which many changes have taken place in practically all activities of the maintenance of way department. This process is by no means complete, and while the roads that have taken the lead in this development have arrived at a common ground, so far as basic principles are concerned, there are still wide differences in the methods of applying them. It is of interest, therefore, to review some of these policies and practices in their current stage of development.

One point on which many railways are now generally in accord is the need for a considerable degree of centralized control over the equipment. On not a few roads this has led to the creation of the position commonly designated by the title "superintendent of work equipment," ordinarily with system jurisdiction but with authority restricted to a grand division or region on some of the larger properties. Concerned in the start primarily with technical problems incident to the purchase and maintenance of the machines, the training of operators, etc., the men in these positions or some other system or grand division officers have gradually been given an increasing degree of responsibility for the distribution and use of the various classes and types of power tools and equipment.

As a result of such centralized administration of appliances used in maintenance of way, these appliances have come to be grouped in three different categories, depending on the types of machines and to some extent on the policies governing their use on different railways. These three groups are (1) machines assigned to the divisions on a more or less permanent basis, (2) those assigned to the divisions, but subject to transfer from one division to another as needed, and (3) those assigned to system gangs that move from division to division as their work progresses.

However, it is impossible to set up any positive rule for the segregation of types or classes of machines to these various categories because the policies of different roads vary widely.

For illustration, on the Chicago & North Western and the Chicago, Milwaukee, St. Paul & Pacific most of the work equipment and power tools are under direct system supervision. Likewise, on the Southern Pacific Lines in Texas and Louisiana all equipment is assigned from system headquarters as needed, and a somewhat similar policy is pursued on the Boston & Maine.

Two Plans

On the Chicago, Burlington & Quincy there is a general assignment to the grand divisions, while movement from division to division on these grand divisions is made under the direction of the general superintendents and the district engineers maintenance of way. In contrast with this practice, the Illinois Central assigns most of its equipment, such as tamping outfits, bolt tightening machines, mowing machines, discing machines and motor cars, to the divisions, for the reason set forth by L. H. Bond, engineer maintenance of way, as follows:

"We feel that this results in a more conscientious use of the equipment, both in securing maximum efficiency in making proper repairs at minimum cost. Other equipment, such as ditching machines, draglines, oiling machines, rail cranes and adzing machines, is assigned to one or the other of our two grand divisions, and its use is directed by the district engineers while repairs are supervised by our supervisor of work equipment."

Both the Atchison, Topeka & Santa Fe and the Louisville & Nashville assign most appliances to the divisions on a more or less permanent basis.

Several Criteria

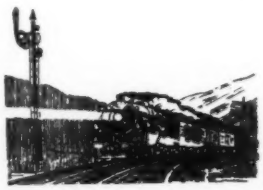
Several general criteria are followed in determining what equipment shall be assigned more or less permanently to the divisions. Some roads place in this category all machines for which there is an almost constant demand—the track motor car is the extreme example of this classification. Other roads assign small units to the divisions and keep large machines under system or grand division control. On the Missouri Pacific, "system" equipment is limited to units mounted on M. C. B. trucks. In general, however, the primary criterion is whether the machines can be kept busy within the confines of one division. On the Pennsylvania, for example, 37 out of a total of 77 classes of power tools and work equipment are retained under the jurisdiction of the regions, whereas 40 classes are assigned in whole or in part to the divisions or supervisors' territories.

Among the means that have proved effective in obtaining intensive utilization of work equipment is the organization of system gangs that move from division to division as their work progresses. The Milwaukee, which was a pioneer in this field, applies this plan to rail laying, ballasting, bolt tightening and ditching. Much the same policy is pursued by a number of other roads with respect to the so-called major operations. This is but an adaptation of a procedure that has been followed for many years on most roads with respect to steel bridge erection and major repair work on steel bridges, and for the same reason, namely, to insure a maximum utilization of large and costly equipment that is not usable in other classes of work.

The system gang has much to commend it. In the first place, it assures that the machines will be at work until the gang completes the program that has been scheduled for it. Furthermore, it obviates the development of an exact schedule for the transfer of the machines from one gang to another, and the complications which ensue when the work on a division is delayed because of unfavorable weather or other obstacles.

Longer on the Job

But these considerations are of minor importance compared with the prime argument for the system gangs, namely, the advantage that accrues from keeping one group of men engaged in a given operation for the longest possible time. Every gang must be trained for its job; it must go through several days of low production before it is keyed up to its work and every man has been assigned to the task for which he is best fitted. With a system gang this low production is confined to a short period at the beginning of the season, and is not repeated every time the equipment is turned over to a new gang on a different division. But experience has shown, also, that a system gang will improve its output progressively as the men become more skilled in their work, and that this improvement will continue for a period that exceeds the normal existence of a division gang.



Aside from rail laying, bolt tightening, ditching, ballasting and steel bridge work, this plan is being applied also to painting gangs equipped with sand blasting and paint spraying outfits, rail-end welding and heat treatment, and on the Union Pacific, and a few other roads, to tie renewal gangs. In a measure, the extent to which system gangs are employed is influenced by agreements with the various organizations regarding seniority rights. On some roads the movement of men from one division to another is confined to work equipment operators having system seniority rights.

Transfer of Equipment

A more generally observed policy for obtaining the maximum utilization of equipment is the transfer of machinery from one division to another, in accordance with some form of program or schedule. This plan has been followed for years by the Great Northern with respect to the season's work for steam shovels and cars in ballast service and for machines used in laying rail, ditching and bank widening.

Some roads go so far as to develop a time schedule for each machine, giving the date on which it is to be transferred from one division to another. On others the program has a more tentative status, serving as a guide to sequence of activities rather than as a mandatory schedule, the actual date of transfer being determined during the season as conditions demand. Practice varies on different roads, but experience indicates that transfers of large machines, such as pile drivers, locomotive cranes and ditchers, can be made in accordance with a much more definite program than is readily possible with the smaller equipment.

But regardless of the exact procedure followed, the plan requires a determination of the number of units of each kind required by each division and a study of these requirements in the light of the equipment available. On the Pennsylvania, for example, each division prepares a tabulation showing the number of machine-tricks that must be worked each month by each type of equipment to complete the program work for each month, the term "trick," rather than "day," being used because certain machines are sometimes double-shifted. These tabulations are consolidated in the region and system offices for the purpose of comparing

the demand for machines with the supply and making the necessary transfers between regions as well as divisions.

Checking Output

To what extent should regional or system officers check the output of the work equipment in use? The answer varies with the policy of the management. Some system officers receive daily reports of the output of large machines (not infrequently by wire) and daily progress reports of the work of mechanized gangs. On other roads daily reports go no farther than the division officers—where they form the basis for monthly reports that go to headquarters. These two schools of thought are exemplified by the comments made on this point by three engineers maintenance of way. One, from H. R. Clarke of the Burlington, is in part as follows:

"The daily reports are checked by all officers concerned and very closely by the district engineers maintenance of way, as well as those in the general manager's office, gaging performance by what experience has shown is to be expected under the conditions covering the work being done, and prompt inquiry is made of local officers in charge if the output is not up to the standard."

The following from A. A. Miller of the Missouri Pacific presents another line of thought:

"Policing of machines to insure continuous and efficient operation is in the hands of the division on which the machine is being used. Division supervisory officers are expected to see that machines are used as continuously as work at hand will permit."

The same view is offered in a statement by L. L. Adams of the Louisville & Nashville:

"Where equipment is used with a gang, the foreman is required to keep daily data on its performance and submit monthly reports of operation to the division engineer. Where equipment is not assigned to a gang the operators make the reports. These reports are then forwarded to the system office where they are studied. If a certain machine is not performing satisfactory, or is not used to the extent possible, the division engineer is called upon for an explanation."

Statements by E. E. McCarty, assistant to vice-president, Atchison, Topeka & Santa Fe, and A. L. Bartlett, engineer maintenance of way of the New York, New Haven & Hartford, stress another means of checking the performance of equipment; namely, frequent visits to the gangs by the regional or system work equipment officer or his representatives.

One advantage of close supervision of the operation of work equipment from system headquarters is the opportunity it affords for the development of improved methods through a study of the performance of gangs or crews on individual divisions. The cost and field studies carried out by the Chesapeake & Ohio have been especially fruitful of results along this line. There is a difference of opinion, however, regarding the extent to which system standards of practice and organization should be applied.

Advantages of standardization in organization are set forth in the following statement from B. R. Kulp, engineer of maintenance of the Chicago & North Western, who also directs attention to some of the obstacles in the way of complete uniformity.

"We have established a system-wide standard plan for our large steel laying gangs, which indicates the consist of men and machinery required to accomplish a standard daily output of work. We find that it is of great assistance in organizing a gang quickly and that it affords a very accurate measure of a day's work and is, therefore, very helpful in programming a season's work. On small jobs, which are handled by a small division gang with only a few units of power machines, we do not attempt a standard plan, as such work is generally done under conditions which do not lend themselves to standardization."

The Follow-Up

A standard method of performing a task is of no value unless it is enforced, which raises the question as to the measures necessary to insure enforcement. However, as the method is only the means to the end, system officers are guided much more in their judgment by the results, as indicated by performance and cost records, than they are by field inspections.

Notwithstanding this, field organization and procedure are subjected to scrutiny. On the Northern Pacific, for example, it is the practice of division and system officers to check gang make-up against the standard setup shown on prints that they carry with them in the field. Other roads rely on the supervision excercised by the system or grand division work equipment officers who spend most of their time visiting one gang after another during the active season.

On the Burlington, the division staff is held responsible for adherence to established practice, subject to supervision by the district and system engineers maintenance of way. Much the same rule is observed on the North Western, but experience has shown that local conditions sometimes make it necessary to depart from standard routine.

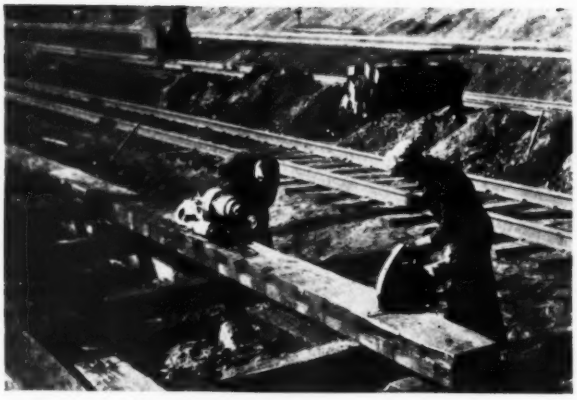
What Results

Systematic and thoroughly co-ordinated supervision of the use of work equipment is insuring the maximum utilization of the machines in the possession of the railroads, within the practical limitations imposed by the conditions under which the work is done. It also affords a much more reliable basis for determining the actual need for the acquisition of additional units of the various types than was possible in the days when one division might have a shortage of machines when another had a surplus.

Improved control of the equipment affords an opportunity for some measure of seasonal distribution, so that the work is done on different parts of a system when conditions are most favorable. However, there are practical restrictions on the attainment of this objective, as shown by the following statement by E. A. Craft, engineer maintenance of way, Southern Pacific Lines in Texas and Louisiana:

"Obviously the greatest economy ought to be realized by keeping the work equipment busy the year around. Ordinarily this cannot be done and any close approach to it involves doing some kinds of work on some divisions during a season of the year which, from the standpoint of weather conditions, traffic movement, or otherwise, is not the best time to do the job. Extravagance and waste would certainly result from the provision of an amount of work equipment on any railroad that would permit each division to do all the jobs requiring the use of work equipment during the season most favorable to such work. From a division standpoint this would be desirable but from a system standpoint it is not justified. Within reasonable limits, the greatest economy is likely to be realized from work equipment if the supply is a little short of the requirements rather than in excess of them."

Backing Up The Bridge



The New Haven Forces Make Extensive Use of Their Many Hand, Power Saws

Since the reorganization of bridge and building forces on the New Haven in 1936, to put them on a more flexible and efficient basis, this road has been carrying forward a program of equipment purchases which has already gone a long way toward fitting each gang with a full complement of readily portable power tools, including one-man saws and drills. These tools are now considered indispensable by both the men and the road, as each succeeding job shows large economies and savings in physical effort over former hand methods.

STIMULATED by the depression, the New York, New Haven & Hartford has become increasingly alert to the advantages and economies possible through the use of suitable power tools and equipment for carrying out the many laborious and costly operations involved in bridge and building maintenance. As a result, following careful studies of the specific requirements of its various gangs, and careful purchases in line with these requirements, it is nearing the completion of a program which will eventually place in the hands of its forces all of the power tools and units of work equipment available to permit them to do their work in the most expeditious and economical manner.

The New Haven, whose principal main lines extend from New York City to Boston, Mass., and from New Haven, Conn., to Springfield, Mass., with a network of branch lines throughout this general area, comprises 2,097 miles of lines and 4,850 miles of tracks. Operating largely in highly developed industrial territory, with many passenger and freight station and auxiliary buildings, and crossing many streams, rivers and bays along its "Shore Route" to Boston and back through the more rugged interior, bridge and building work on this road has always assumed large proportions.

While the replacement of many main line timber bridges with steel structures during the last 10 or 15 years has reduced timber trestle maintenance on the road appreciably, there remain a large number of timber deck bridges, a few trestles and many other wooden structures, on which maintenance is a substantial item. Thus, in common with many other roads, the New Haven, with limited available funds, is still confronted with a large annual bridge and building maintenance program. To solve this problem, which it was recognized offered sizeable opportunities for economies, the road decided in 1935 upon a program which aimed to equip its bridge and building forces with all those new or improved power tools and devices that could demonstrate their effectiveness beyond question in increasing the speed with which work can be done, and in producing economies over earlier methods.

Gangs Reorganized

It should not be understood from the foregoing that the use of power tools by bridge and building forces of the New Haven is entirely a development of the last few years, because these forces have long had available to them many of the basic units of equipment necessary to their work, and, at the outset of the depression in 1930, were fairly well outfitted with the types of equipment then available. However, with the major changes in general economic conditions that have occurred since 1930, and with the improvements which have been made in tools and equipment for carrying out bridge and building maintenance operations since that time, the road has carried forward a program designed to its bridge and building forces on an increasingly effective basis. Each year a few improved units have been added to the equipment available to the bridge and building forces, and in 1936, these forces were completely reorganized to put them on a more flexible and efficient basis. Since that year also, the bridge and

and Building Forces

Woodworking Machines at the Various B. & B. Shops Permit High Class Work With Speed and Economy

building forces have been provided with highway trucks to permit their unrestricted movement to any point on the road without regard to train service.

In the gang reorganization, the equivalent of more than forty 6 to 10-men gangs were set up, with headquarters at more than 20 different points. The gangs vary in size from single outfits, with usually 8 men and a foreman, to large terminal gangs of 40 to 50 men, with 5 to 6 sub-foremen and a general foreman. The larger gangs are usually made up of five or six of the smaller gangs, which can be employed either separately, or as one large group on large-scale or especially heavy operations.

Equipment Investigated

Coincident with the reorganization of forces, there was increased recognition of the need for enlarging the equipment available to the new gangs in order that they might carry out their operations most effectively and economically, and with the least physical effort. As a result, an investigation was initiated to determine the power tool requirements of the new set-up of forces. This investigation disclosed a need for modernizing and increasing the flexibility of many of the existing heavier units of equipment on the road, and for equipping each gang, large or small, with an increased complement of modern power tools.

As a result of the investigation, a program was set up which will ultimately provide each of the smaller gangs with a rachet-type chain hoist; a hand, power saw; a hand, power drill; and a small-capacity electric generating unit which will not only operate the saw and drill, but which will also be available for providing current for night illumination. The same program provided that each of the larger gangs should be equipped with a 6-in. hand, power saw; a 3-in. hand, power saw; 2 or 3 hand, power drills; 1 or more rachet-type chain hoists; a ½-bag concrete mixer; a portable, power-operated pump; and a power generating unit of somewhat larger capacity than that supplied to the smaller gangs.

Recognizing the impossibility of making immediate purchases sufficient to equip completely each of the gangs on the road in accordance with the program set up, and, at the same time, of carrying out the modernization of some of the existing heavier units of equipment, it became the immediate aim of the committee to purchase those smaller power tools and units which would fill the greatest need, and which would show the greatest economy. As a result of its recommendations, several portable light-weight generating plants, electric saws, electric drills, chain hoists, pumps and trailer-type concrete mixers were purchased during 1936.

All Units Tested

The greatest care was exercised in the purchase of this equipment, especially the generating units and power saws and drills, in order to be assured that they not only filled the capacity requirements of the various classes of work to be carried out, but also that they would stand up under the intensive use to which they would be subjected. As a matter of fact, severe field service tests were made of all of the different units considered before they were purchased.

The general use of the new equipment secured justified the recom-

One of the 1250-Watt Generators Driving Two Drills in Guard Rail Work

21 Highway Motor Trucks of Various Types Serve the B. & B. Forces for Handling Men, Tools and Machines and Materials

mendations of committee immediately; so much so, that, in spite of the continued necessity for economies, a considerable number of additional power units were purchased for the bridge and building forces in 1937, including, in addition to power saws and drills and trailer-type concrete mixers, two sets of pile driver leads for use with locomotive cranes and two Diesel engine-powered tractors, each equipped with snow plow, bulldozer and front-end loader.

As a result of these additional purchases, the bridge and building forces now have available a wide range of power tools and equipment, including gas and steam cranes; highway trucks; air compressors (of rubber-tired, flange-wheel mounted and skid-mounted types); paving breakers; nut runners; jack hammers; close-quarter drills; chipping hammers; bolting drills; stone drills; wood borers; scaling tools; riveting hammers; electric bridge tie dapping machines; 1¼-ton rachet-type chain hoists; rachet-type wrenches (24-in. handle, equipped with a set of sockets to take nuts of bolts up to ⅞ in. in diameter); bridge augers (32 in. long and 1 3/16 in. in diameter); self-propelled ditchers, equipped with booms, dipper sticks, clam shell buckets, drag line buckets, etc. (all steam operated, except 5 recently converted to gasoline-engine drive); concrete mixers (½ bag to ½ yd.—all portable and gasoline-engine operated—some two-wheel, rubber-tire mounted; some four-wheel, steel-tire mounted); paint spraying outfits; wood-working machines located at the shops of the larger gangs; portable gasoline engine-driven table saws for use in the field; sand blasting outfit; a two-man power saw; one-man power saws; electric drills; portable electric-generators; power-operated pumps of both the diaphragm and centrifugal types; kerosene oil thawing torches; cement guns (used with 250-cu. ft. compressors); tractors (equipped with snow plows, front-end loaders and bulldozers); sidewalk and roadway sanding machines; highway trailers (two with pneumatic-tired wheels for handling long timbers, piling, etc.); acetylene cutting outfits for large gangs; and a rotary broom attachment for mounting on electric storage battery trucks.

Most of these tools and units of work equipment are assigned exclusively to the bridge and building department, but a number of the units, including air compressors, locomotive cranes, ditchers, thawing torches, etc., essentially roadway department units, are always available to the bridge and building forces.

Cutting 8-in. by 16-in. Timber at a Long Crib Wall Job, While Two Men Move the 130-Lb. Generator as Necessary

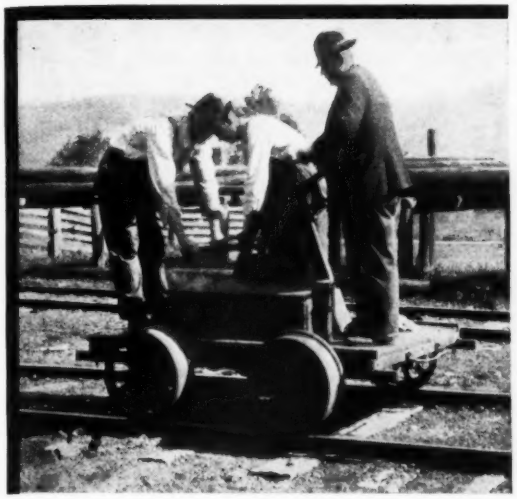
Two of the most significant aspects of this quota of work equipment are the recent sizeable investment in light-weight, portable electric generating units and in power saws and drills, and the large number of highway motor trucks assigned to these forces for the movement of men, materials, tools and equipment. It is also of interest to note the program now under way for increasing the flexibility and adaptability of the ditchers on the road, five of these units having already been converted from steam to gasoline-engine drive, and equipped with booms and with clam shell and drag-line buckets, as well as dipper sticks.

The first of the highway trucks for bridge and building forces were purchased prior to 1930, when, as a result of the sharp curtailment of local passenger train service, the need for a supplementary form of transportation for these forces became apparent. Gradually, the number and types of trucks were increased, until the bridge and building department now has 21 trucks with capacities from ¾ tons to 3 ton, and with four different types of bodies. These trucks, which are now used almost exclusively instead of track motor cars, supplement a fleet of 60 highway trucks assigned to the roadway department, 17 trucks assigned to the signal department, and 3 trucks employed by the work equipment department, all of which are available to the bridge and building department forces in emergencies. In connection with the highway trucks on the road, it is of interest to note that the equipment includes several pneumatic-tired-mounted concrete mixers and five pneumatic-tired trailers for use on the highways.

Light-Weight Generators

The increased interest of the New Haven in small power tools, while prompted by the necessity for greater economy in performing work, was stimulated to a large extent through the relatively recent development of light-weight electric generating units which could be handled to and from, and moved about on, the job with little difficulty and no loss of time. Prior to 1936, the road had available an adequate number of compressors for the operation of air-driven tools, and two heavy, large-capacity electric generating units, and while these were used effectively in connection with many large jobs, there was some question about their economy on smaller jobs. Furthermore, there was a dislike on the part of the men to the use of these heavier units un-

(Continued on page 190)



Obsolescence in Work Equipment

What Is Its Economic Effect?

WHAT effect are changes in maintenance practices having on work equipment? How do new developments in power machines affect those now in use? What influences, other than wear and tear, should lead to the retirement of existing equipment? In other words, what are the causes of obsolescence in work equipment, and how does one recognize that a power machine has become obsolete or is approaching that stage? What action should be taken with respect to obsolescence?

These are apparently simple questions that should be answered with equal simplicity. When they are analyzed, however, it is found that they are not so simple as they appear on the surface. They are not superficial but should be of deep concern to every railway officer, from those who use the equipment to those who are responsible for its purchase and for policies with respect to maintenance practices.

Improving Methods

This is not a static age. Changes are occurring in almost every phase of human activity with a rapidity that is little short of bewildering. This is as true of railway maintenance as it is of other forms of endeavor. Manufacturers are constantly designing new power machines for maintenance-of-way applications and improving existing designs. Maintenance methods are changing with equal rapidity, and the mutual reactions of these changes are having a profound influence on maintenance practices and on the use of work equipment.

For these reasons, the maintenance officer who fails to keep abreast of the developments in his field soon finds himself outclassed by those who are more alert. To avoid this, it is necessary that he not only familiarize himself with what others are doing, but he should also study his own operations to see in what ways they can be improved and whether the newer practices that others are following are better or more economical than his own. This study should include a thorough investigation of work equipment to determine the economies that can be effected by purchasing additional units of types already in use; the economies that can be effected by purchasing additional types; and the relative economy of his present equipment compared with newer designs.

Although important in many ways, we can dismiss the first consideration from discussion at this time, for it does not represent a change in practices or in the use of equipment but merely an increase in the number of power tools in use and, therefore, an extension of practices which, it can be assumed reasonably, have been found satisfactory and economical.

The second consideration calls for some discussion, for the purchases of types not heretofore used may affect both the maintenance practices of the road and some of the equipment already in use, as well as create a demand for other types. If the additional types replace manual methods they may bring about decided changes in maintenance methods and result in larger economies, but have no effect on the use of other equipment, this being illustrated by the steam ditchers which first came into general use about 35 years ago. Tie tampers exemplify another type of equipment that had little effect on existing equipment, for they comprise one of the earliest types developed. Yet they have led to the use of the power jack for large surfacing operations.

Again, as rail sections continued to increase, a demand was created for a rail crane to supersede the slower, uneconomical and unsafe manual method of laying rail. The rail crane, like the tie tamper, did not displace other types of equipment, but in turn created the need for additional types, since the number of men needed to keep other operations synchronized with the placement of the rail was increased unreasonably. As a result, a properly-equipped rail gang today is using spike pullers, bolting machines, tie adzers and spike drivers, the development of which followed logically the use of the rail crane.

If, however, the new equipment is intended for applications which are already being performed by power machines, and can do the work for which it was designed better or more economically than the types in use, it may have a profound effect on both practices and existing equipment. This is illustrated by the side-dump car for ditching and grading and by the bottom-dump car for ballast service. These cars immediately made the flat car, the lidgerwood and the unloading plow obsolete for both ballasting and earth-moving. Carrying the illustration a step further, the large-capacity motor truck and the crawler-mounted wagon have in turn made the side-dump car obsolete for large-scale grading operations.

Causes of Obsolescence

This leads to a consideration of the causes of obsolescence. Basically, obsolescence means the process of growing old, of decaying or of fall-

ing into disuse. For the moment we can eliminate the second meaning as applied to work equipment, since it is well recognized that a power unit may become obsolete without having suffered from either decay or disabling wear. This is shown by the fact that the lidgerwood and plow became obsolete without reference to their physical condition and by the further fact that the flat car that fell into disuse for grading and ballasting may still have been in condition for many years of revenue service.

It is evident, therefore, that obsolescence as applied to work equipment has a different meaning. Briefly, this is that equipment becomes obsolete when methods have changed to the extent that it is no longer adapted for the work upon which it had previously been engaged, or when newer designs have become available, which place the older ones at a disadvantage with respect to economy, operation or upkeep. It has been a characteristic of the railways that obsolete equipment does not always fall into immediate disuse for, to continue the former illustration, instead of retiring them, the majority of roads continued to use their lidgerwoods and plows until they were worn out, while some even replaced them in kind, rather than invest in the more modern equipment that had become available. This attitude toward obsolescence will be discussed later.

Why It Occurs

While there are many examples of the fact that new types of equipment may possess sufficient economic or operating advantages to render existing equipment obsolete, obsolescence occurs more often by reason of changes in maintenance practices or through improvements in the design of existing units. In considering this matter, it should be borne in mind that the basic cause of obsolescence may also be that new conditions have arisen, and that the changes in practices that have taken place and the new designs which appear to be creating obsolescence, are merely responses to new needs. Again, obsolescence may be created through the utilization of equipment heretofore available but not previously used. As a rule, however, obsolescence does not result from a single cause but from several, although it can generally be traced to the need for greater economy or better results in maintenance.

This can be illustrated by motor cars. When falling revenues subsequent to 1929 made a reduction in maintenance activities imperative, one of the immediate results was that two and three-men section gangs replaced the six and eight-men gangs that had prevailed up to that time, and these smaller gangs have become permanent on not a few roads. The motor cars on hand were unsuited for section use because they were too heavy and cumbersome to be handled with safety by reduced gangs. Motor-car manufacturers quickly developed lighter cars of greater efficiency and better operating characteristics, so that the older designs are in the process of replacement, as is evidenced by the number of new motor cars purchased in 1937.

Notable Examples

Probably the most notable example of obsolescence is that of equipment for gas and electric welding and for grinding rails, because it is of such recent application in maintenance. While equipment of all three types was available prior to 1930 and had been used more or less sporadically, substantially all of the development that has brought them to their present stage of perfection has occurred since that date. The result has been that not only are the earlier designs completely obsolete, but most of the intermediate designs as well.

Portable air compressors and pneumatic tie-tamping tools provide another familiar but typical example of the way in which obsolescence occurs through improvements in design. Although portable air compressors and pneumatically operated tools had been used in other fields for several years, a surprisingly large amount of experimental and development work was necessary before equipment suitable for tamping ties was produced. After it was placed in service, operating characteristics were observed, parts were redesigned and improvements were added, to the extent that the earlier designs of both the compressors and tamping tools became obsolete despite the advance that they had represented when they were first perfected.

Those early power units were single-stage compressors, a type that is notably inefficient. It took years of further development to produce a portable compressor that is inherently more efficient than the original design, but in their constant search for greater dependability and higher efficiency, manufacturers were able later to produce a portable two-stage compressor that at once made the older straight-line unit obsolete. Coincident with this development, manufacturers have produced low-air-consumption tie-tamping tools that have made the older designs of these tools obsolete.

Similar comparison can be made of present designs with earlier designs of more recently developed equipment, such as tie adzers, spike pullers, bolt tighteners, drills, track mowers, weed burners, rail cranes, portable wood-working tools, tractors and a multitude of other devices that are still in service, in which it is obvious that the greater efficiency and better operating characteristics of the current models have created obsolescence in the earlier designs.

One of the most recent developments that is forcing obsolescence in certain types of equipment has its origin in the decisions that are being handed down by the National Railway Adjustment Board, in which men from the train service are being placed on rail-bound units of work equipment that are able to move under their own power but which cannot be removed readily from the track. In general, these train-service employes replace no other employes and perform no productive labor. For this reason, they increase the cost of operating the equipment, often disproportionately because of the differential in wages, with no offsetting advantages of greater production or better operation.

These decisions, together with the increasing cost of work-train service and the loss of productive time on busy main tracks by reason of clearing trains are combining to eliminate the economy of more than one type of rail-bound equipment and to make the use of off-track designs more attractive, since they are not subjected to this loss of time or added cost. As a result, obsolescence is developing in not a few types of equipment whose use is confined to the track.

Can Be Recognized

From the foregoing it is obvious that there are many causes of obsolescence in work equipment. When these are traced back they lead invariably to the need for greater economy, for better operation, for more dependability or the fact that the equipment is not adapted for use under the changed conditions.

It is equally obvious that there should be no difficulty in recognizing obsolescence. If the physical condition of a unit becomes such that its operation is not safe or dependable, if the cost of operation or upkeep is too high in relation to the investment in it or the objectives sought in its use, or if a new device or a later model of the device in use will do the work better and more economically, the unit has become obsolete.

In the past, railway men have been strangely slow to comprehend the

principles underlying obsolescence. To most of them obsolescence occurs only as a result of disabling wear. They did not recognize that obsolescence continues at the same rate during periods of rest as during periods of intensive use, or that a machine can become obsolete without having been used or without having lost any of its original efficiency.

It is not debatable that the wood burning locomotive is obsolete today, because changed conditions and increased demands for locomotive performance have rendered it pitifully ineffective. While this is an extreme example, if the same test were applied to many units of work equipment now in use, they would be placed in the same category as the wood-burning locomotive. No doubt there will be considerable dissent from this statement; yet its truth can be easily verified by any contractor whose profits depend on the effectiveness and excellence of the performance of his equipment.

This discloses one of the important reasons why railway officers have been slow to comprehend the principles of obsolescence. It is that maintenance-of-way work has never been considered from the commercial standpoint of profit and loss. It is true that these officers are constantly seeking ways to reduce costs, but the most conscientious and intelligent efforts in this direction are not backed by the same incentive as if the work were on a commercial basis and its success or failure financially depended on the effectiveness of the tools in use.

It has been pointed out that once in possession of work equipment, many railway officers are prone to hold onto it until it is worn beyond the possibility of further use, despite the demonstrated advantages of new devices or of later models of those they are using. That this custom still prevails in some quarters is shown by the fact that of the 64 air compressors purchased in 1937, not including those in new tie-tamping outfits, only a few were secured for the replacement of existing units, the remainder being bought as additional units. It is not intended to imply that this attitude is universal, for not a few officers are replacing their old models of various types of equipment at a rate that is keeping their machines up to date.

No one will question the need for additional compressor units or criticize their purchase. It is astonishing, however, that so few of those purchased were for replacements, especially when it is considered that the great majority of the compressors now in service are of the older and inherently inefficient designs and that from a physical standpoint most of them have long since passed the limit of economical service life.

It is recognized that there is a crying need for more power machines and tools, even on those roads that are best equipped. Yet, no maintenance officer can do his road a greater disservice than, without protest, to continue the use of obsolete equipment. Too often the measure of economy in the use of a power machine has been a comparison of the results obtained from it with those of manual labor. This is a false assumption, since the comparison should be made with the economy of more modern designs of the same equipment or with other types that are better adapted for the work in hand.

Where Are We Heading?

(Continued from page 165)

trend toward a wider use of small power tools is given by the number of air compressors and electric generators that were purchased specifically for their operation, for all of the generators shown in the list, except those for welding, were bought for this purpose. Likewise, although a relatively small number of the air compressors were bought for the replacement of worn and obsolete units, an appreciable number were intended for the operation of small tools, as is shown by the capacity of the individual units.

Off-Track Units Favored

Another trend that is gaining momentum is shown by the number of crawler-mounted units that were included in the 1937 budgets. Increased speeds for both passenger and freight trains are making the use of rail-bound equipment increasingly difficult and on some lines the productive time of such units has been reduced to the extent that their use on heavy-traffic main tracks is no longer economically feasible. Furthermore, rising costs of work-train service are accelerating the movement toward the use of off-track equipment, for many jobs can be done with such equipment at a fraction of the cost of the same work with equipment that requires a work train. Still another factor that is making the use of off-track units more attractive is the growing demands from train-service men, many of which have been approved by the National Railroad Adjustment Board, that they be assigned to supervise the movement when on main tracks, of rail-bound units that move under their own power, and thus do not require the service of a work train.

Evidence that this movement toward a wider use of off-track equipment is well under way is the fact that 11 of the 17 cranes, other than rail cranes, shown in the list of 1937 purchases were crawler-mounted, while all of the 42 draglines and power shovels had similar mountings. As a further indication of the trend away from rail-mounted equipment, 29 tractors were purchased, many of which included bulldozers and front-end loaders for use in ditching and grading, as well as many other incidental units for off-track use. Still further evidence of this trend is seen in the fact that a number of the air compressors and of the welding generators were mounted on tractors.

Replacement Demand Growing

Another well-defined trend is that toward the modernization of existing equipment, as is clearly apparent from a study of the units purchased in 1937. Manufacturers have frequently expressed the fear that some types of equipment were reaching the point of saturation and that as a consequence the market for their products would soon be confined to replacements and repair parts. This fear has been expressed most often by the manufacturers of motor cars, with some reason if it be granted that their premises are correct, for motor cars are more widely used than any other type of maintenance of way equipment. Yet, 1,714 motor cars of all types were purchased in 1937, all of which, except a relatively few large inspection cars and a few heavy-duty cars, replaced obsolete units. In other words, while the movement toward the replacement of obsolete models of motor cars is as yet in its early stages, it is evident that the movement toward modernization is well under way, and by the time this cycle is completed, a second cycle of modernization will be necessary.

Any one making a study of the work equipment purchased in 1937 can discern other trends, as well as additional indications of those that have been mentioned. Those that have been cited are sufficient, however, to show that the use of work equipment is expanding and that the cycle of replacement is well under way, not only for motor cars, but for other types as well. It is equally evident that maintenance officers stand ready to change their practices to utilize new types as soon as they are convinced of their advantages.

Machines and Men

New Factors Influence Trends in the Use of Work Equipment

WORK equipment and power tools are being employed to an increasing degree in the maintenance of tracks, roadway and structures because they have demonstrated that their use saves money. In some operations they relieve labor of the most arduous tasks. In others they carry out the work with a greater degree of refinement than is possible with even the most skillful workmen. In still others they do the work so much faster than it can be done by hand that it would be virtually impossible to crowd enough men on the job to accomplish the same task in the same time by manual means.

But no matter just how the machines demonstrate their effectiveness and efficiency, they are being bought and used with just one object in mind —to save money. Maintenance of way officers have no choice in this matter; they must search out every possible means of reducing the cost of keeping up the properties under their direction, not only in order that they may do their part in insuring the solvency of the railroads but also because the railway managements are charged with the duty of moving traffic at the lowest possible cost. Any curtailment of economic practices, reduces the amount of money which may be available for the employment of men in other endeavors where manual work is essential.

In their relation to the use of power appliances the railroads are confronted with exactly the same situation that has confronted all industry since the invention of the steam engine started the industrial revolution. In brief, each industry has been compelled to avail itself of every means of reducing the cost of the product it makes or the service it performs, or else meet defeat at the hands of some other industry that is more progressive in its adaptation of the results of research or inventive genius. The result has been the gradual mechanization of industry the world over.

The Highest Paid Man on This Job Is the Trainman at the Right

Effect of Wage Levels

There are exceptions, of course. Where wages are extremely low, as, for example, in China, it is difficult to make even a bare start in introducing power equipment, because the saving in labor is so small that it does not offset the interest on the cost of the machinery. On the other hand conditions in this country are especially favorable for the introduction of power appliances in all classes of industry because the American workman receives the highest wages in the world. It goes almost without saying, therefore, that every increase in wage rates offers a still further incentive for the purchase and use of machinery that will increase the productivity of labor.

That this relationship between wage rates and the use of power tools is a real one was aptly illustrated during the depth of the depression, in 1932 and 1933, when the decline in wage rates of maintenance of way employees caused many railway officers to question the economy of continuing the use of some classes of work equipment. But this was a temporary condition that was removed with the restoration of wage rates.

During the last year the railroads have been confronted with two developments that have influenced their use of power appliances, namely, the increase in the wage rates of their maintenance of way employees and the growing insistence of train service employees that they be placed on rail-bound power equipment. In so far as the wage increase is concerned, little need be said, for, as explained above, any increase in wages increases the economy of using power tools and the incentive for buying them.

As indicated above, the demands of the train service brotherhoods are giving as much concern to the employees of the maintenance of way department as they are to the officers of the railways. Specifically, pressure is being applied to require the manning of rail-mounted machines with conductors and flagmen, and, in not a few cases, with enginemen and even firemen. Most of the progress made thus far in advancing these demands has come about through cases carried to the National Railroad Adjustment Board, although resort has been made also to legislation. In Wisconsin, for example, a statute has been enacted that substantially pre-

cludes the use of rail-bound equipment on main tracks without the services of a full train crew.

The demands made by the train service brotherhoods arises from the introduction of the internal combustion engine as the prime mover for the newer self-propelled equipment employed in maintenance work, whereby it has been possible to dispense with a locomotive for the handling of all but the larger and heavier rail-mounted machines. Because some of the work done by these lighter gasoline-operated outfits was formerly done with the aid of a work train it is contended that train service men should be employed on these outfits. This position disregards the fact that many of the operations performed by the new rail-mounted equipment were formerly done by hand labor or were not done at all, and it ignores, of course, the economics involved in so far as they relate to the solvency of the railroads.

Progress Has Been Made

As a result of agreements arrived at through negotiations between the railroads and representatives of the unions and of decisions handed down by the National Board of Adjustment, considerable progress has been made by the train service men in gaining their objectives. But up to the present, at least, there is considerable diversity in the terms of these agreements or decisions, as affecting different railroads or parts of the country. Not all of the cases carried to the board are decided in favor of the employees, but as all decisions made have their origin in complaints filed by the employees and none on complaints from managements, every case in which a complaint is acted on favorably means one more restriction on the use of work equipment.

The general trend of the agreements or decisions is to require the employment of a conductor and a flagman with any unit of equipment, of such design or weight that it cannot be removed readily from the track, when it is operated on main track. This requirement is also being applied to equipment on yard and side tracks, except such as are not used in normal train or switching service. Other exceptions relate to a shovel in a ballast pit, provided the shovel is not used to switch cars; to a crane operated over a single yard track, provided the crane is not moved through a switch. Still another applies to a crane working in a material yard, or to a pile driver operated on a track that is out of service.

An illustration of what can happen in the settlement of these controversies is afforded by the outcome of a case taken to the Adjustment Board by employees of the Central of Georgia. An understanding of this case calls for a brief outline of the manner in which the board functions.

The board is divided into four divisions, each of which hears cases brought to it by designated groups of employees; the First division, for example, handles complaints of the train service brotherhoods, while the Third division handles, among others, cases involving maintenance of way employees. Each division is composed of an equal number of members appointed by the railroads and by the unions. In the event of a tie vote, the division selects a referee who casts the deciding vote.

In 1918 the Central of Georgia bought a Dean-Williams weed destroyer, a rather large unit of equipment mounted on a flat car for jetting steam supplied by a locomotive that is used to propel it along the track. The machine was operated by an assistant foreman and three track laborers. In 1930 the railroad bought a Fairmont weed burner and in May of the following year an agreement was made by the management with the Brotherhood of Maintenance of Way Employees covering the rates of pay for the operators of these burners and similar machines. In 1935, the locomotive engineers claimed the right to operate these weed burners, citing a rule that appeared in their schedule in 1919, which read as follows:

"Where electric or gasoline power is substituted for steam, such power will be manned by Engineers—"

This claim was taken to the first division of the board, and owing to a tie vote, the case was decided by a referee, who said:

Two developments of the last year will exert marked influence on the future utilization of work equipment. One of these is the wage increase of 5 cents an hour (approximately 15 per cent) which went into effect on August 1, and increases proportionately the economies possible through the further use of work equipment. The other is the increasing pressure of the train service brotherhoods for the placing of their men on rail-bound equipment, which is promoting the use of equipment of off-track designs

"The use of the weed burner under its own power operating on the main line is substituting other motor power, for steam, and under Article 1, paragraph f, the operating of this machine for movement under its own power should be performed by the engineers."

Maintenance Men Taken Off

When the railroad placed locomotive engineers on the weed burners in compliance with this decision, thereby displacing the maintenance of way employees, the Maintenance of Way brotherhood filed a claim with the third division of the board, alleging that the railroad was violating an agreement by displacing these men. As there was also a tie vote in the case before this division, the matter was again decided by a referee, but not the same one who decided the first case. His decision sustained the claim of the maintenance of way employees, and he concluded his opinion as follows:

"—since it is unreasonable to assume that it was intended that these machines, essentially utilized for the destruction of weeds rather than for the movement of equipment, be manned both by locomotive engineers and maintenance of way employees, the carrier should seek relief from the burdensome requirements of its agreements as thus interpreted through negotiations with all the parties involved."

Just how this is to be accomplished was not explained.

This case is not cited as typical of what may be expected in the normal conduct of cases, and it is possible that changes in procedure will preclude a recurrence of such conflicting decisions. However, it serves to illustrate some of the complications that are involved in effecting a settlement of these controversies. It shows also why it is difficult to hazard any sort of a forecast as to the eventual outcome of these efforts of train service employees to take over the work of maintenance of way men.

One way out that is now being studied closely is an increasing use of crawler-mounted equipment of all kinds, thereby avoiding the issue of jurisdiction and also gaining the advantage of non-interference with train movements. This does not contemplate the complete discarding of rail-bound equipment because the use of flanged-wheel machines in some classes of work will continue to be the most effective procedure, regardless of the restrictions and obstacles that may reasonably be expected to be placed in its way.

Crawler Equipment—An Answer to

Above—Crawler Tractors with Front-End Buckets Are Used Widely in Ditching and Cut-Widening Service

Largely because of the growing desirability of taking maintenance work equipment off the rails, crawler-mounted equipment is being utilized in maintenance of way work to a greater extent than ever before. In this article the characteristics of the crawler tractor that adapt it to maintenance work are reviewed, the various tractor accessories that are applicable to this work are described and their applications noted, and specific instances of the utilization of crawler tractors in maintenance work are recounted. Similar treatment is accorded that class of crawler-mounted equipment that is designed for excavating, material handling and allied operations.

Above and Right—Levelling Right-of-Way with Tractors Equipped with Push Blades of the Side-Casting Type

TO AN increasing degree as time goes by maintenance officers are finding it necessary and profitable to carry out maintenance of way tasks with work equipment that may be operated independently of the track, and in crawler-mounted equipment they have found a practical solution to the problem thus imposed. The equipment that is finding application in this respect falls naturally into two broad classifications, namely (1) crawler tractors and (2) those larger crawler-mounted units that are designed specifically for ditching, material-handling and related operations.

The potentialities of the crawler tractor in the maintenance field first began to receive serious consideration about a decade ago, and since that time it has grown steadily in importance as a unit of work equipment. The favorable reception which the crawler tractor has been accorded may be attributed to two principal factors. These are (1) the inherent mobility which permits such tractors to be driven practically anywhere on the right-of-way or elsewhere and (2) the availability of a wide range of attachments by means of which numerous diversified tasks may be performed.

By virtue of its method of traction, the crawler tractor can operate under its own power over extremely soft ground, across bridges, through tunnels and along the shoulder of the roadbed, thus making it possible to adapt the tractor, as a power plant, to tasks which would otherwise normally be performed by track-mounted equipment. Hence, by reason of the ability to operate the equipment independently of the track, delays to the

Illustrating Another Operation in Which Tractor-Mounted Push Blades Are Finding Application

Present Day Needs

work occasioned by the passage of trains are reduced to a minimum, while additional economies are effected as a result of the elimination of work trains and other more-expensively manned equipment. Moreover, because of its ability to make its power plant and tractive effort available in locations remote from the track and inaccessible to other types of equipment, the crawler tractor makes possible the mechanization of much work, such as the cleaning of ditches, that could otherwise be done only with teams or hand labor.

Crawler tractors can be loaded on flat cars or push cars under their own power for transportation to the point of use; skilled operators are unnecessary; they can be permitted to come to rest on steep grades without danger of overturning; and the use of the tractor as a power plant for furnishing welding current or compressed air makes it possible, because of the ready portability of the unit, to use relatively short lengths of cable or hose, thereby reducing power and friction losses.

The fact that crawler tractors are available in a range of sizes has done much to adapt them to a variety of maintenance tasks requiring power units of different characteristics. Measured by the maximum drawbar horsepower, the sizes range from about 22 to about 97 although it is generally considered that a drawbar horsepower of about 50 is sufficient to enable them to handle the heaviest tasks of a routine nature to which they may be assigned in railroad maintenance work.

Except for the smaller sizes, the various makes of tractors may be obtained in models powered with Diesel as well as with gasoline engines. Speeds of the tractors range up to 5 miles per hour or more in high gear and, while standard models usually have only one speed in reverse, directional transmissions are available by means of which it is possible to obtain the same speeds in reverse as in forward gear. This feature is of particular value where the tractor is being used for such work as ditching, where it is necessary to operate in reverse much of the time.

Attachments Are Fundamental

Basically, of course, the crawler-tractor is a power plant capable also of exerting tractive effort and, hence, the number of different tasks which it can be made to perform is dependent to a large extent on the number and character of the attachments that are made available. In other words, its versatility as a multiple-purpose machine of year-around utility is limited only by the variety of attachments that are supplied for use in connection with it. However, consideration must also be given to the fact that, in itself, the tractor is useful as a hauling unit and in this connection it is being used for such operations as the shifting of track in curve-realinement work, the switching and spotting of cars and in general haulage duty.

Above—Cleaning a Drainage Ditch with a Tractor Equipped with a Side-Casting Push Blade. Right—A Tractor with a Blade Grader, Another Combination That Is Proving Useful on the Railroads

Many of the tractor attachments used in railroad maintenance work are mounted directly on the tractor and obtain power for their operation from the tractor engine. As a rule, it is a relatively simple matter to attach them to the tractor or to remove them to permit the application of a different attachment. In fact, on some jobs, particularly in grading operations, the tractor may be operated with several different attachments in the course of a single day's work.

Prominent among the tractor attachments that are particularly applicable to railroad maintenance operations are those designed for use in grading, ditching, material-handling and allied operations. These include front-end loaders or ditchers, push blades of both the right-angle and the side-casting type, all types of drag and wheel scrapers, blade graders, and shovels and booms.

Loaders and Push Blades

Of these probably the most commonly used in railroad service are the front-end loaders or ditchers and the push blades. The former consists of a shovel or scoop mounted on the front end of the tractor in such a manner that, by means of either hydraulic or mechanical action, it can be elevated the desired amount and tilted so as to discharge its contents into a car, over the edge of an embankment or elsewhere. The scoop has a flat bottom, is usually of a width to correspond to the over-all width of the tractor treads, and has a capacity of about a cubic yard or less. While obviously adaptable to a variety of material-handling operations, this unit seems to be finding its widest application in ditching and ditch-cleaning service. In this work the machine usually operates from one end of the cut toward the middle, obtaining successive loads by forcing the scoop, with the tractor in low gear, into the material and then conveying the load to the point of disposal by operating the tractor in reverse.

Loading Snow

Railroads have also found that the front-end loader constitutes an efficient device for loading snow into open-top cars. By this means it has been found that heavy falls of snow can be quickly and economically removed from platforms, team tracks, drives and other open spaces around freight and passenger terminals. Thus, in view of its diversified applications, the front-end loader is a device of year-around utility, and any tractor equipped with it may be employed in ditching or other work during the working season and then transferred to a terminal for snow-handling service during the winter months.

Like the front-end loader, push blades of the side-casting type, are finding wide application in maintenance service. This device consists essentially of a blade mounted on the front end of the tractor and is so designed that the angle which it makes with the tractor can be adjusted to adapt the unit to the particular job in hand. The blades are usually raised and lowered hydraulicly by means of a lever in the hands of the operator. Experience on a number of roads has demonstrated that crawler tractors equipped with this device offer a highly effective and economical means of reducing and levelling piles of material that have accumulated along the tracks over a period of time as a result of ditching operations. Other operations to which they are being applied include back-filling, bank-widening, the leveling of material in various operations, the cleaning of drainage ditches and snow removal. Bulldozers, being similar in design to the angle blades, except that they are attached to the tractor in a fixed right-angle position, are subject to more or less similar applications, being particularly adapted to material-spreading and related operations.

Roll-over scrapers, two-wheel and four-wheel self-loading scrapers, and ordinary slip scrapers comprise another sub-division of grading and material-handling accessories that is contributing to the versatility of the crawler tractor in railroad service. With tractors as the power unit, these devices are being used widely for such operations as widening embankments, cleaning and digging side, culvert and other drainage ditches, for cleaning

Above—The Crawler Compressor in This View Is of the Type That Is Designed Specifically for This Type of Service

Right—Here the Machine in the Foreground consists of a Standard Crawler Tractor on Which a Compressor Has Been Mounted

bridges and culverts where the opening has been narrowed as a result of the presence of deposited matter, and for similar applications.

Where the cross-section of bridges and culverts is not sufficiently large to permit the passage of a tractor for cleaning purposes a dragline scraper may be used in conjunction with a double-drum hoist mounted on the tractor. In such applications the tractor is spotted at a convenient point and an A-frame is set up to serve as the support for sheaves carrying the scraper cable. A "dead man" placed at the opposite end of the culvert or bridge completes the assembly. Similar set-ups have been used for cleaning side ditches in cuts and for other earth-moving jobs where the use of a dragline is indicated.

Another piece of grading equipment that is serving to enhance the versatility of crawler tractors in railroad service is the blade grader. Not only is this type of equipment being used in the usual grading and slope-shaping applications, but it is also being employed in ditching service, in which event it may be operated in such a manner as to cast the material up along the side of the ditch to form a dike.

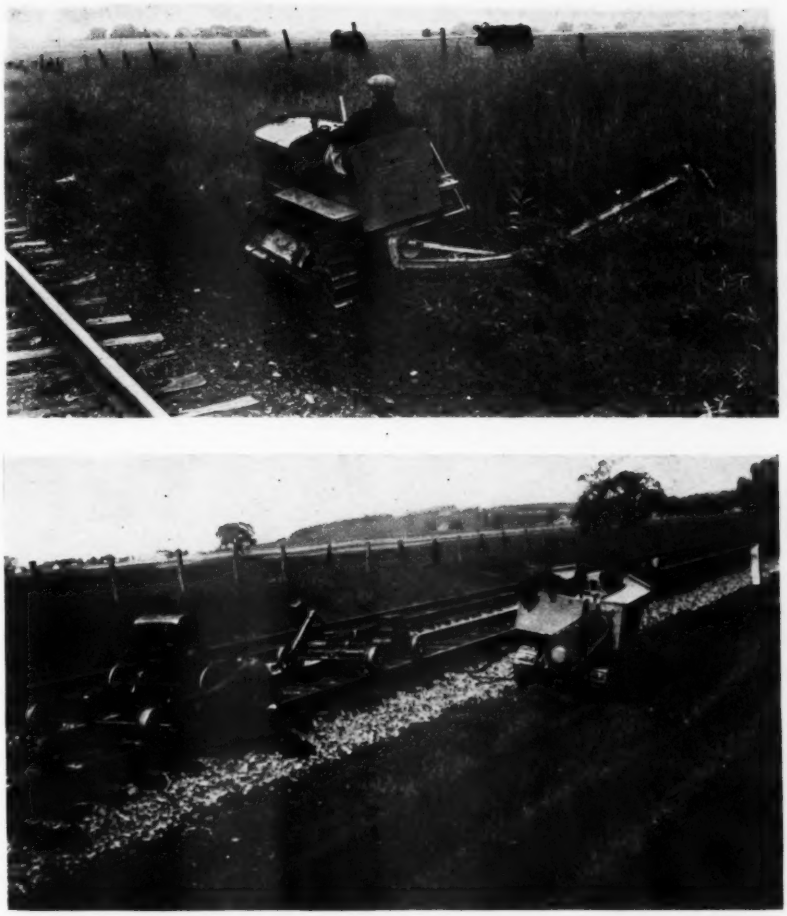
Cranes and Booms

Cranes and booms in a variety of makes, sizes and types are available for attachment to crawler tractors. The majority of these are of the type that projects from the side of the tractor and, hence, are known as side booms or cranes. While non-revolving, this type is provided with both boom and load lines and is applicable to the handling of a wide range of miscellaneous materials. As an example, one railroad reported that a crawler-tractor mounted side boom was used with excellent results for taking up and loading the rails, ties and other materials from an abandoned track.

Revolving cranes, with booms that swing through arcs up to 300 deg. or more, are also available for mounting on crawler tractors. These are generally convertible for use either as shovels, draglines, clamshells, pile drivers or cranes and, of course, are applicable to operations where the use of such equipment is indicated.

Air Compressors

Air compressors mounted on crawler tractors have attained wide acceptance among railroad maintenance departments, and on a number of roads that have had considerable experience with this combination it is considered



Top—A Weed Mower Mounted on a Crawler Tractor. Bottom—Crawler-Mounted Welding Generators Present Another Opportunity for Taking Work Equipment Off the Track

standard equipment. In fact the application of crawler-compressors to maintenance work is considered to have such broad potentialities that at least two crawler units are now available which are designed solely for the purpose of providing compressed air.

Since they obviate the need for operating heavy equipment on the rails, it is only natural that crawler-mounted compressors should find their widest field of usefulness as a means of providing compressed air for the operation of tie tampers. With both tractors and compressors available in a range of sizes it is possible to obtain combinations for the efficient operation of the different sizes of tamping outfits in common use.

But the application of crawler compressors in maintenance work is not confined to surfacing operations—they are being employed to advantage in practically all maintenance operations that involve the use of compressed air. These include the operation of portable air tools such as saws, drills, chipping hammers, concrete breakers, sheeting drivers, back-fill tampers, caulking hammers, riveting hammers and grinders. Other applications include spray painting, sand blasting and cement-gun work.

Welding Generators

The increasing importance of electric arc-welding in the maintenance of rails and metal structures is another factor that has contributed to the usefulness of the crawler tractor in maintenance work. Since this development created a demand for a mobile welding generator capable of operating over the right-of-way independently of the track, railroad men were quick to visualize the advantages of the crawler tractor when used for this purpose. As manufacturers of welding outfits were anxious to co-operate in promoting the use of their equipment in this manner, little difficulty was experienced in making available welders in a range of sizes that are adaptable to use with crawler tractors.

Such units are now used extensively in track work for building up

battered rail ends, repairing frogs, switches and crossings and in bridge work wherever the arc-welding process is used in repairing and strengthening members and connections. As in the case of the crawler-compressor, a crawler-welder has been developed in which the welding unit forms an integral part of the machine. The application of this latter machine is, of course, confined entirely to welding work.

Other Attachments

Other crawler-tractor attachments that are adapted to use in railroad service include snow plows, post-hole diggers, weed mowers, single and double-drum winches, fire-break plows and belt driven saws. Post-hole diggers generally consist of an auger attached to a rack bar which is driven from the tractor engine by means of a rear power take-off. These machines are designed for boring holes up to 20 in. or more in diameter and 7 ft. or more in depth, and usually embody a power-operated derrick to facilitate the handling of large poles. Weed mowers for attachments to tractors comprise one of the more recent developments and consist, in each case, of a more or less conventional cutter bar that is attached to the tractor at the proper level.

While Used Principally in Grading Service This Tractor Also Provides a Handy Means for Shifting Track

One application of tractor-mounted winches, namely, for operating draglines, has already been mentioned. They are also used in hoisting and towing service generally and have been utilized in such widely diverse applications as stringing overhead wires, and in bridge erection work and building construction. Tractor-mounted snow plows find their application in railroad service in clearing platforms, drives and other open spaces following snow storms, while in the case of fire-break plows and belt-operated saws the crawler tractor simply replaces the power unit that was formerly used.

In the foregoing, the various crawler tractor attachments and their applications in railroad service have been briefly described. It is also of interest to observe the manner in which the more common of these attachments are being utilized on different railroads, and this phase of the subject will be treated in the following paragraphs.

Among those railroads that are using crawler-tractors extensively in ditching and earth moving service is an eastern carrier which has eight units in such service, all of which are equipped with front-end loaders. Since the railroad in question is one that is widely known for its practice of applying cost accounting to all maintenance operations it is significant that it has chosen to utilize tractors in this service on such a wide scale. Another carrier, this one in the west, has five tractors with front-end loaders in the same type of service. On this road the tractors are hauled about over the line on specially-equipped cars, each of which has a space at one end for carrying the tractor while living quarters for the tractor operator are provided at the other end of the car.

One of the relatively large number of railroads that use tractors in connection with bulldozers or side-casting push blades, works its tractors two eight-hour shifts daily. The shifts are so arranged that they over-lap and during this period both operators devote their time to the servicing of the tractors and to the making of any repairs or adjustments that may be necessary. As a result of this plan, about 12 hr. of active service is obtained from each tractor every working day. These tractors are used principally for spreading material that has accumulated in piles along the track as a result of ditching operations, and the material is handled in this manner at a cost of less than 10 cents per cubic yard.

Variety of Attachments

As an indication of the growing consciousness on the part of the railroads of the versatile characteristics of the crawler tractor, a number of recent purchases of this type of equipment have included a variety of accessory devices. To go with a crawler tractor which it purchased, a railroad in the Southwest also acquired a side-casting push blade, a hand-controlled blade grader, a revolving scraper and a weed-mower.

A Crawler-Mounted Earth-Borer in Operation

Similarly, for use in connection with a new tractor which it recently purchased, a small terminal company has a push blade, a road grader, a dragline and a weed-mower. The chief engineer of this company advises that this machine is used principally in grading for new tracks, hauling ties, rail and other materials, for cutting weeds and for maintaining various roadways on the property. "We have also been very successful," he continued, "in cleaning out with a dragline several culverts in the neighborhood of six hundred feet in length which have a tendency to fill up very rapidly because of poor drainage."

Still another road has six tractors with which it utilizes a variety of attachments such as front-end loaders, rotary fresnos and side-casting push blades. This company purchased its first crawler tractor, for use with a ditcher plow, in 1926, and operated this same tractor a total of 104 days in 1937. Another tractor, this one equipped with a front-end loader, was operated 123 days last year while a third was used a total of 126 days. The former unit is operated out on the line in ditching and related services during the working season, but on the approach of winter it is sent to a large terminal where it is overhauled and serviced and then held in readiness for snow-removal work.

This same company also has a 300-amp crawler-tractor mounted welder which it uses for the repair of crossings, frogs and switches. Operated by a crew consisting of a welder and a helper, this unit was in active service a total of 212 days in 1934, 245 days in 1935, 256 days in 1936, and 187 days in 1937. Since this welder was first placed in service, the annual repair costs have averaged about $90, or approximately 3 per cent of the total cost of the outfit.

An illustration of the application of crawler-mounted welders on a broader scale is afforded by the practice of an eastern road, which has eight 300-amp. welding generators of this type in service. Formerly these machines were each assigned to a division, being employed in rail-end repair work during the summer months and in the repair of manganese frogs and crossings during the winter. However, with the thought that the rail-end welding operation could be placed on a more efficient basis thereby, the railroad has recently adopted the practice of operating seven of the welders in a group, with each welder completing six joints, three in each rail, before he moves up to a new station.

In commenting on the results obtained with tractor-mounted welders in this type of service, the chief engineer of this company remarked: "We have no difficulty whatsoever in operating them at any point on the railroad, and use lead wires 200 ft. in length." After pointing out that his company also has two small tractor-mounted shovels and one tractor-mounted compressor in service, the officer went on to state that "I have had the idea for a long time that off-track machines were, generally speaking, the proper equipment to use. An ideal line-up on this railroad would be to have all of our tamping machines of the tractor-mounted type, including not only large machines for use in extra-gang work, but a small machine on each section for tamping up low joints, which work it is impossible to do satisfactorily by hand in stone ballast."

The foregoing views were reiterated in the statement of the principal assistant engineer of another road which utilizes a number of tractor-mounted welding generators in both track and bridge repair work. These units, he said, "have proved very satisfactory" and "we feel that the economy has more than justified the investment. The possibilities for the development of this type of equipment are numerous, particularly for handling work which is now done by work trains, such as driving piles, laying rail, etc., where the delays due to traffic take up so much working time."

Among those railroads that are making extensive use of crawler-mounted compressors in track-surfacing work is a large western carrier. This company has eleven compressors of this type, including eight crawler-tractor mounted compressors and three of the outfits that are designed only for use as crawler compressors, each with a capacity sufficient for operating an eight-tool tamping outfit. These machines are distributed over the system and are assigned to large out-of-face surfacing gangs, being used interchangeably in such gangs with track-mounted compressors. Crawler-mounted compressors for use in surfacing gangs are now standard equipment on this road and it is highly pleased with their performance.

In Snow-Removal Service

As an example of the labor-saving potentialities of the crawler tractor when employed in snow-removal service may be cited the experience of a New England road with this type of equipment. After pointing out that crawler tractors have been used for a number of years on this road in the removal of snow from station grounds, platforms, driveways and tracks in the streets, the assistant chief engineer of the company added:

"These tractors are performing work formerly undertaken by hand labor, horse-drawn scrapers and work trains. One type of tractor has a detachable and reversible steel blade attached to the front end, which is operated from the cab by a hand-controlled hydraulic lift. The tractor thus equipped is used principally for clearing station platforms and for bunching up snow in the station grounds and driveways. With one of these tractors we estimate that we can accomplish as much snow removal work in about 8 hr. as was formerly completed by 50 men in 10 hr., using scoops and shovels.

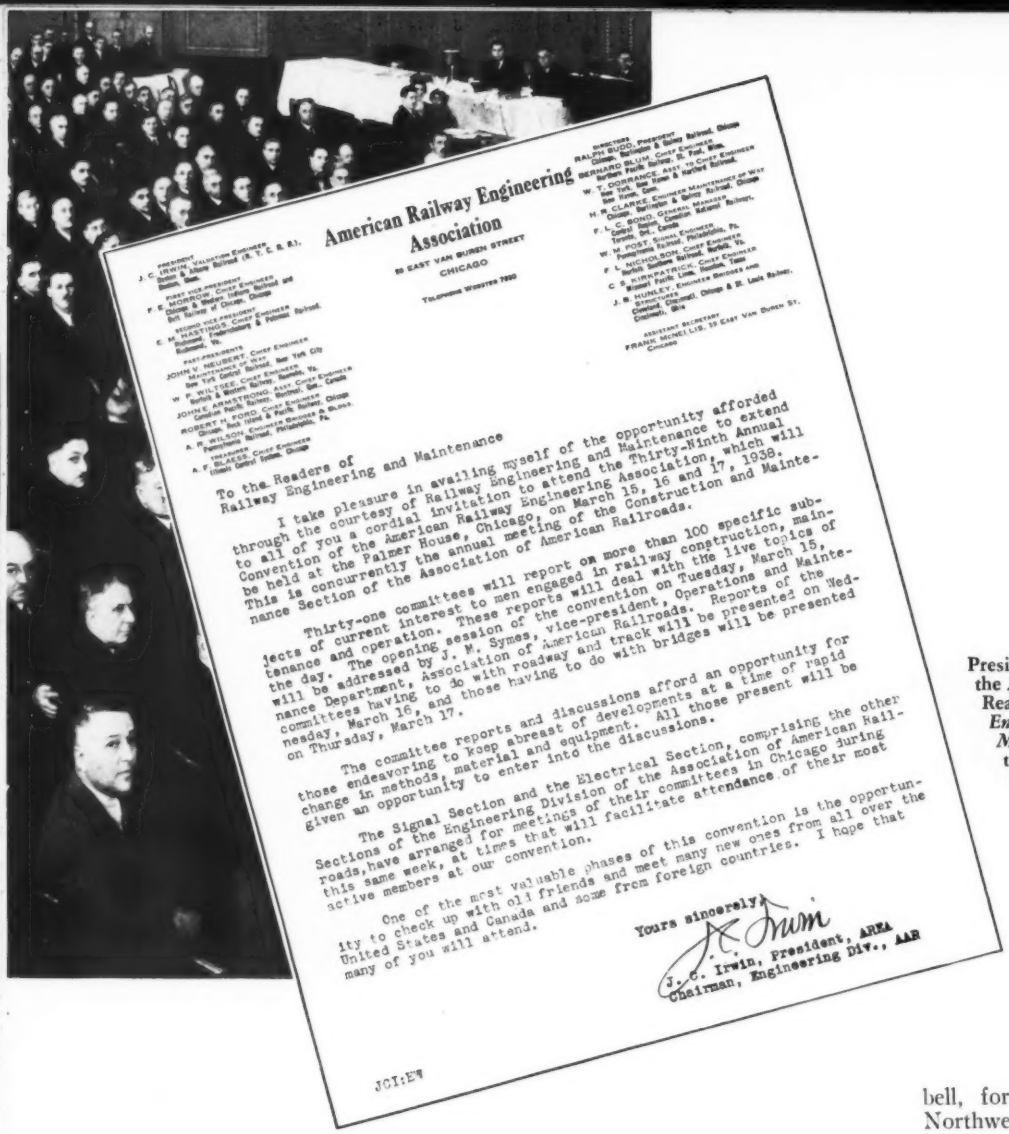
"On another tractor we use a detachable V-plow on the front of the machine, which is likewise operated from the cab by means of a hand-controlled hydraulic lift. This machine is used around the station

Crawler-Mounted Units of the Larger Sizes Are Also Finding Wide Application in Railroad Service

grounds, public loading facilities, tracks in streets and at other locations where there is a heavy accumulation of snow. After the snow has been arranged in piles by the tractors we remove the plows and attach to the rear of each machine a slide bottom wood scraper of about three cubic yards capacity, each of which is operated by two men. With these scrapers the snow that has been accumulated in piles in the streets is disposed of by piling it in comparatively small areas, and in this work it is estimated that two tractors will accomplish in 12 hr. during the night, when highway traffic is at its minimum, as much work as was formerly performed in 10 hr. by a work train and 70 men. Outside of the winter season we use these tractors for hauling heavy material in storage yards, for spotting cars in gravel pits, and for other maintenance tasks."

In the foregoing paragraphs have been cited a few of the instances in which crawler tractors are being employed to advantage in maintenance applications. The list could be extended indefinitely, but the examples cited are typical and suffice to give some idea of the potentialities of the crawler tractor as a unit of maintenance of way work equipment.

(Continued on page 190)



American Railway Engineering Association

59 EAST VAN BUREN STREET
CHICAGO

TELEPHONE WABASH 7800

To the Readers of
Railway Engineering and Maintenance

I take pleasure in availing myself of the opportunity afforded through the courtesy of Railway Engineering and Maintenance to extend to all of you a cordial invitation to attend the Thirty-Ninth Annual Convention of the American Railway Engineering Association, which will be held at the Palmer House, Chicago, on March 15, 16 and 17, 1938. This is concurrently the annual meeting of the Construction and Maintenance Section of the Association of American Railroads.

Thirty-one committees will report on more than 100 specific subjects of current interest to men engaged in railway construction, maintenance and operation. These reports will deal with the live topics of the day. The opening session of the convention on Tuesday, March 15, will be addressed by J. M. Symes, vice-president, Operations and Maintenance Department, Association of American Railroads. Reports of the committees having to do with roadway and track will be presented on Wednesday, March 16, and those having to do with bridges will be presented on Thursday, March 17.

The committee reports and discussions afford an opportunity for those endeavoring to keep abreast of developments at a time of rapid change in methods, material and equipment. All those present will be given an opportunity to enter into the discussions.

The Signal Section and the Electrical Section, comprising the other Sections of the Engineering Division of the Association of American Railroads, have arranged for meetings of their committees in Chicago during this same week, at times that will facilitate attendance of their most active members at our convention.

One of the most valuable phases of this convention is the opportunity to check up with old friends and meet many new ones from all over the United States and Canada and some from foreign countries. I hope that many of you will attend.

Yours sincerely,

J. C. Irwin, President, AREA
Chairman, Engineering Div., AAR

JCI:EW

A.R.E.A. 39th

President Irwin of the A.R.E.A. invites Readers of *Railway Engineering and Maintenance* to attend the Annual Convention.

THE American Railway Engineering Association will hold its thirty-ninth annual convention on March 15-17, and as for a number of years in the past, this meeting will be held in the Grand Ball room of the Palmer House, Chicago. The American Railway Engineering Association is unique among organizations in the railway field and, in fact, among technical associations at large, in the volume of its work. It functions primarily through 31 standing and special committees composed of more than 900 members of the association. Each of these committees is working on from one to ten specific problems.

Diversified Program

For these reasons the subject matter presented at the convention is of such a diversified nature that any railroad officer who attends is sure to gain much information that is of definite value to him.

The reports will deal with such live problems as the shape and size of waterway openings; ballast sections; the re-use of treated ties after removal from track; service tests of various types of joint bars; the lubrication of rails on curves; wearing surfaces for platforms; specifications for aggregates for portland cement concrete; the design, operation and maintenance of fire hydrants; the recruiting and training of men for supervisory maintenance positions; standard accessories for motor cars, and many others.

Honorary Memberships

A special feature of the program this year will be the conferring of honorary memberships on four past-presidents, namely, W. B. Storey, former president of the Atchison, Topeka & Santa Fe, C. A. Morse, former chief engineer of the Chicago, Rock Island & Pacific, J. L. Campbell, former chief engineer of the Northwestern Pacific, and J. G. Sullivan, former assistant chief engineer of the Canadian Pacific. The convention will be addressed on Tuesday morning, March 15, by J. M. Symes, vice-president, Association of American Railroads and on Wednesday noon Charles Donnelly, president of the Northern Pacific will be the speaker at the association's annual luncheon.

Joint Dinner

For the third successive year, the members of the association have been invited to join with the Western Railway Club in the club's March dinner and meeting on Wednesday evening, March 16. The subject for discussion is Rail Damage and the Relation of Locomotives Thereto, and the speakers will be A. A. Miller, engineer maintenance of way, Missouri Pacific, and D. S. Ellis, chief mechanical officer, Chesapeake & Ohio-Nickel Plate-Pere Marquette Lines. This meeting, which will be held in the Hotel Sherman, will be preceded by a reception and oyster bar in the Mez-

To Hold Convention

A wide variety of subjects covered in reports of thirty-one committees

zanine and Club Room at 6:00 p.m. and a dinner in the Grand Ball room at 7:00 p.m.

The program of the convention, indicating the order of the committee reports, is given at the right. In accordance with the usual practice the meeting will convene on Tuesday morning, and will continue through Thursday. It will be presided over by J. C. Irwin (valuation engineer, Boston & Albany), president of the association, assisted by Vice-Presidents F. E. Morrow (chief engineer, Chicago & Western Indiana), and E. M. Hastings (chief engineer, Richmond, Fredericksburg & Potomac).

Value of the Convention

With the need for more efficient and economical operation of the railroads looming larger as time goes by, it is expected that interest and attendance at the convention will be maintained this year at the usual high level. Moreover the program covers such a broad field that it is certain to offer something of direct interest and immediate value to every one who is engaged in any phase of the operation, construction or maintenance of the railroads. As it has been so aptly phrased by Mr. Irwin in the accompanying letter "the committee reports and discussions afford an opportunity for those endeavoring to keep abreast of developments at a time of rapid change in methods, materials and equipment."

Program

39th Annual Convention

Palmer House, Chicago

Tuesday, March 15

Morning Session—9:45 to 12:30

Convention called to order
President's address—J. C. Irwin
Conferring of honorary memberships
Address by J. M. Symes, vice-president, operations and maintenance department, Association of American Railroads
Reports of the Secretary and the Treasurer
Reports of committees on
- Standardization
- Signals and Interlocking
- Buildings

Afternoon Session—2:00 to 4:00

Reports of committees on
- Electricity
- Yards and Terminals
- Shops and Locomotive Terminals
- Water Service, Fire Protection and Sanitation
- Uniform General Contract Forms

Adjournment at 4:00 p.m. for visit to exhibit of National Railway Appliances Association at International Amphitheatre

Wednesday, March 16

Morning Session—9:00 to 12:00

Reports of committees on
- Roadway
- Ballast
- Ties
- Track
- Complete Roadway and Track Structure
- Highways

Association Luncheon, 12 o'clock

Address by Charles Donnelly, president Northern Pacific

Afternoon Session—2:30 to 5:00

Reports of committees on
- Rail
- Stresses in Railroad Track
- Clearances
- Maintenance of Way Work Equipment

6 o'clock

Joint meeting and dinner with Western Railway Club at Hotel Sherman
"Rail Damage and the Relation of Locomotives Thereto"
A. A. Miller, engineer maintenance of way, Missouri Pacific
D. S. Ellis, chief mechanical officer, Chesapeake & Ohio-Nickel Plate-Pere Marquette

Thursday, March 17

Morning Session—9:00 to 12:30

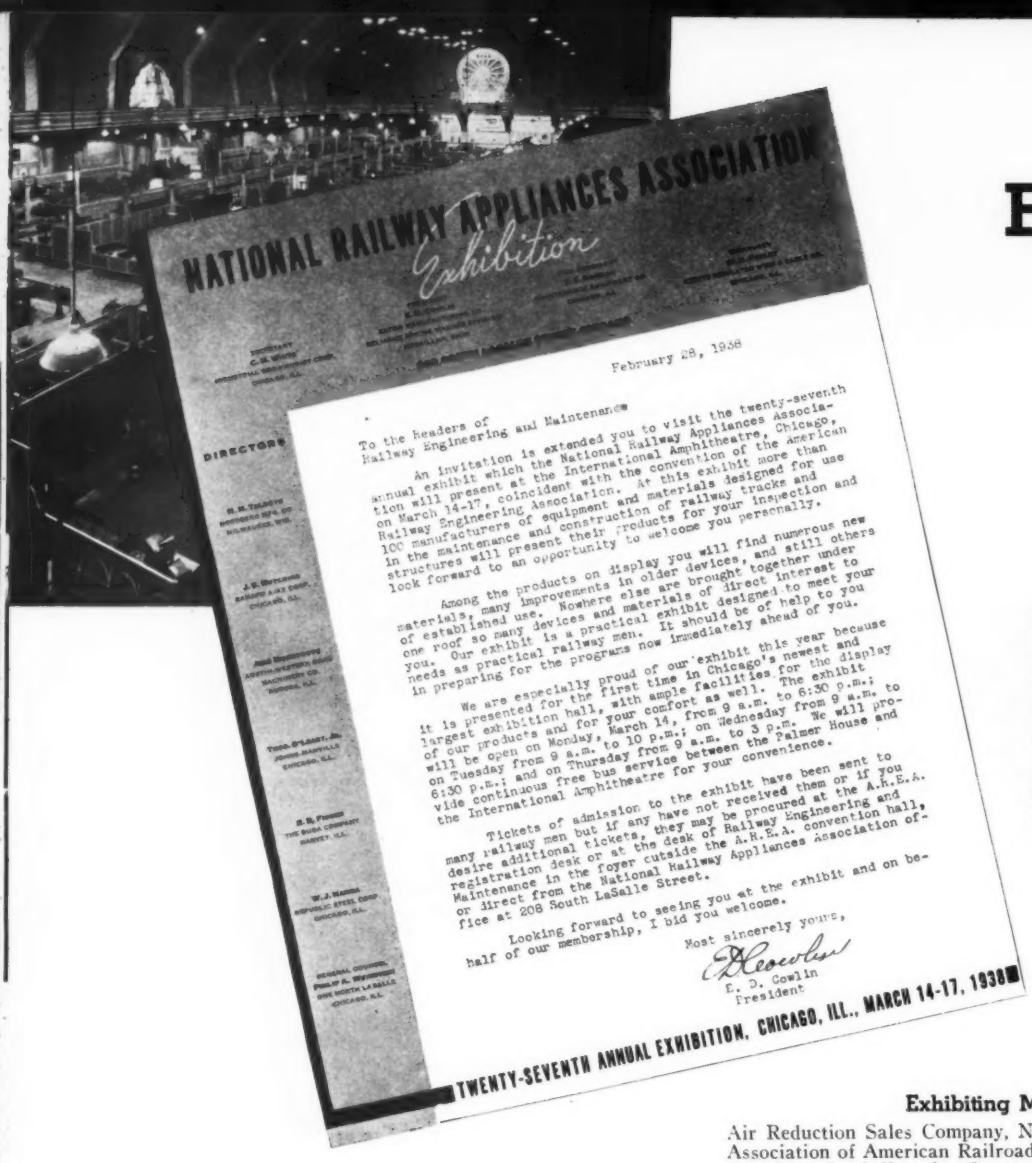
Reports of committees on
- Wood Bridges and Trestles
- Masonry
- Iron and Steel Structures
- Impact
- Economics of Bridges and Trestles
- Waterproofing of Railway Structures
- Economics of Railway Location
- Economics of Railway Operation
- Economics of Railway Labor

Afternoon Session—2:00 to 5:00

Reports of committees on
- Wood Preservation
- Rules and Organization
- Records and Accounts
- Waterways and Harbors

Closing Business

Equipment Exhibit



National Railway Appliances Association, with nearly 100 members participating, will present twenty-seventh exhibit at International Amphitheatre

ON March 14 the National Railway Appliances Association will open its twenty-seventh exhibit in surroundings far more attractive than at any time in the past, for the association this year has availed itself for the first time of the use of Chicago's newest and largest exhibition hall, namely, the International Amphitheatre. This exhibition is the outstanding display of materials and devices employed in the construction and maintenance of tracks and structures.

The exhibit will be open to visitors during four days as follows:

Monday,	March 14—9:00 a.m. to	6:30 p.m.
Tuesday,	March 15—9:00 a.m. to	10:00 p.m.
Wednesday,	March 16—9:00 a.m. to	6:30 p.m.
Thursday,	March 17—9:00 a.m. to	3:00 p.m.

For the convenience of those who desire to attend the exhibition at the Amphitheatre, the association will provide continuous free bus service between the Palmer House and the Amphitheatre during all hours that the exhibit is open.

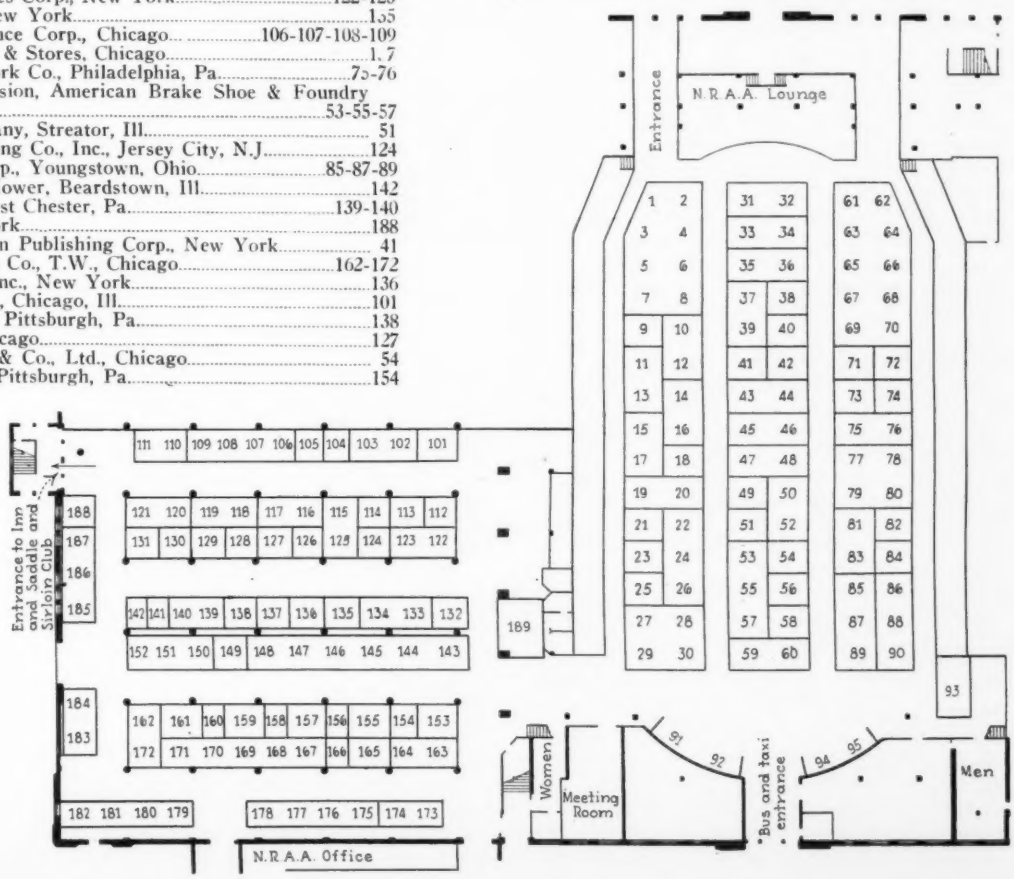
This exhibit is being directed by E. D. Cowlin (Eaton Manufacturing Co., Reliance Spring Washer Division), president, and C. H. White (Industrial Brownhoist Corporation), secretary. The companies which will participate in this exhibit are listed in following columns.

Exhibiting Members

and Materials at Chicago

Associate Members

Adams & Westlake Company, Chicago.
American Chain & Cable Company, Bridgeport, Conn.
American Fork & Hoe Company, Cleveland, Ohio.
American Nut & Bolt Fastener Company, Pittsburgh, Pa.
Armstrong Paint & Varnish Works, Chicago.
Barrett Company, New York.
Bethlehem Steel Company, Bethlehem, Pa.
Blatchford Corporation, Chicago.
Chicago Pneumatic Tool Company, New York.
Detroit Graphite Company, Detroit, Mich.
Frog Switch & Mfg. Co., Carlisle, Pa.
General Railway Signal Company, Rochester, N.Y.
Ingersoll-Rand Company, New York.
Inland Steel Company, Chicago.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Kerite Insulated Wire & Cable Co., The, Chicago.
Magnetic Signal Company, Los Angeles, Cal.
Massey Concrete Products Corporation, Chicago.
National Carbon Company, New York.
National Lead Company, New York.
Okonite Company, Passaic, N.Y.
Pittsburgh Plate Glass Company, Pittsburgh, Pa.
Positive Lock Washer Co., Newark, N.J.
Positive Rail Anchor Company, Chicago.
Pyle-National Co., Chicago.
Taylor-Wharton Iron & Steel Company, Chicago.
Union Switch & Signal Company, Swissvale, Pa.
United States Steel Corporation, New York.
Warren Tool Corporation, Warren, Ohio.
Weir, Kilby Corporation, Cincinnati, Ohio.
Woodings-Verona Tool Works, Verona, Pa.
Youngstown Sheet & Tube Company, Youngstown, Ohio.



Floor Plan of the Exhibit

Crawler Equipment

(Continued from page 185)

That other class of crawler-mounted equipment, namely the larger excavating and material handling machine, is also finding increased application in railroad maintenance work. As with the crawler tractor, the popularity of these larger, more specialized units can be attributed largely to the fact that, since they are capable of operating independently of the track, they make possible the conduct of the work with a minimum of delay due to passing trains, and further, because in many instances such units do away with the need for operating work trains, they result in more economical operation. Moreover, the mobility of equipment of this type renders it adaptable to a wider range of tasks than is the case with track-bound equipment.

Attachments Also Important

Crawler-mounted excavators are ordinarily available with either gasoline or Diesel power, and may be had in a variety of sizes. As with tractors, attachments play an important part in contributing to the versatility of the crawler excavator, and by means of such attachments the same machine may be equipped to operate either as a shovel, a dragline, a pile driver, a clamshell or simply as a crane for handling various materials. Hence, a few of the operations to which a single machine may be adapted include ditching; cut widening; the cleaning of drainage channels and reservoirs; all other forms of excavating work; the loading and unloading of rail, ballast, coal, cinders, concrete aggregates, snow and other materials; laying rail; taking up or shifting track; bridge and building erection work; and the driving of piles for all purposes and under all conditions.

Obviously in most instances such operations can be carried out to the best advantage with the machine working on the ground but, if desired, it may be loaded under its own power on a car and operated therefrom. In the latter connection, it is found advantageous in certain ditching operations to operate the excavator, if the size permits, from a string of side-dump or gondola cars with drop ends. In this manner, with the shovel being driven from car to car, a comparatively large number of cars may be loaded on a single trip. In a similar manner such machines may be used for loading or distributing rail and other track materials.

In conclusion, it is evident that the crawler excavator, like the crawler tractor, is endowed with a high degree of mobility and of versatility, as a result of which it is receiving an increasing amount of attention as a unit of maintenance of way work equipment.

Backing Up The B. & B. Forces

(Continued from page 174)

less a large amount of arduous work was involved.

The newer light-weight generating units now available are of two sizes, or capacities, although they all have the same features of gasoline engine-drive and ready portability. Most of the units have single-cylinder engine-drive, with 1500-watt capacity, and weigh approximately 86 lbs., although, a number of the units are of the two-cylinder type, with 2500-watt capacity, and weigh approximately 130 lbs.

Locomotive Cranes, Some Equipped With Pile Driver Leads, Are Always Available to the B. & B. Forces

The electric drills and power saws furnished for use with these units are all of the hand-held type, and are equipped with long lengths of flexible cable, in some cases more than 100 ft., in order to afford the greatest flexibility of operation with minimum necessity for moving the power units about. The power saws have cutting capacities ranging from 3 in. to 6 in., the larger units permitting the cutting of timbers up to 12 in. by 12 in. by turning them over and making two cuts. The power drills, all of the heavy-duty type, are equipped with drills and augers for drilling holes up to ¾ in. in steel and 1⅞ in. in wood.

With the newer light-weight generating units, there is no hesitancy on the part of the men to take them on even the smallest jobs, for these units can be readily loaded into a truck and moved about on the job by one or two men at most. As a matter of fact, these small units are now considered indispensable.

The committee which investigated the need for these tools, in making its recommendations for purchases, estimated that they would pay for themselves in two or three years, depending upon the extent to which they were used. It also claimed that the equipment would speed up operations, produce a higher quality of work, and stimulate the efforts of the men. That all of these claims have been fully justified, is now readily recognized. In fact, it is known that certain of the power tools have more than paid for themselves on single jobs.

An Illustration

On a recent large freight platform reconstruction job, which involved the installation of 1,060 pieces of 4-in. by 10-in. timber and approximately 80,000 f.b.m. of hardwood decking plank, it is estimated that two men with one of the larger hand, power saws, did more work than could have been done in the same time by eight men with hand saws, and that two of the power drills, with three men, did the work which would have required 10 to 12 men with hand augers. On a recent trestle deck renewal job, involving the drilling of 600 guard timber holes 10 in. deep, two of the power drills completed the work in a half day, whereas, using hand augers, the same work would have required the time of several men for at least two days.

With numerous similar examples of speed and economy on record, the New Haven feels that it has more than justified the expenditures which have been made for additional power tools during recent years, and, as additional money is available, it looks forward to the purchase of the additional units necessary to equip all of its gangs on the most efficient working basis. The reorganization of the bridge and building forces on the New Haven, and the program of suitably equipping them, has been carried out under the direction of E. E. Oviatt, chief engineer, and A. L. Bartlett, engineer maintenance of way, assisted by G. A. Rodman, general supervisor of bridges and buildings of the road.

PRODUCTS of Manufacturers

Pushing and Pulling Pipe Jack

AN improved pipe pulling and pushing jack is now being manufactured by the Duff-Norton Manufacturing Company, Pittsburgh, Pa. This jack, of the geared-rack type, has a capacity of 25 tons. The gearing is enclosed in a grease-packed case, and all gears and the rack are of steel and have machine-cut teeth.

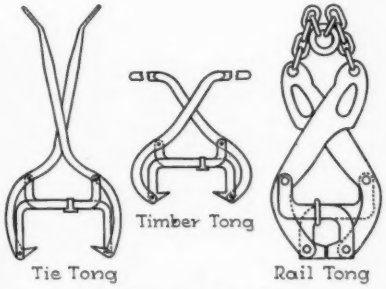
This unit is designed for pushing or pulling pipes through the ground or embankments without the necessity of changing the position of the jack when the direction of movement is reversed. To accomplish this, the jack is so constructed that it can be braced in the jacking pit against movement in either direction after it has been set on the proper alinement.

View of One of the Pipe Jacks Braced in Position Ready for the Jacking Operation

When jacking with this device, 36-in. sections of rods or pipes are used, for which pilots are provided. After the jack has been set up, a section of rod or pipe is coupled to the end of the rack and the jacking started, additional sections being added until the pipe has been pushed through the ground to the receiving end. It is pointed out that a 2-in. pipe can usually be used in the first movement and the size increased thereafter up to 6 in. However, the size of pipe to be used for the initial movement is dependent on the character and condition of the material through which it is to be forced.

Increase Gripping of Tong Jaws

AN increase in leverage and gripping action to provide greater safety and to reduce the cost of handling materials is claimed for the new set of track material tongs recently introduced by the Lundie Engineering Corporation, New York. The line includes a tie tong, a timber tong, and a rail tong, all manufactured in accordance with AREA dimensions, but with the addition of cross members or shanks to form a toggle action. This is said to afford a maximum of leverage and additional gripping action on the opposed jaw members, which is expected to diminish the chance of accident and damage to materials. The tie tong and timber tong are of forged open hearth steel and the rail tongue of cast steel, to meet AREA specifications.



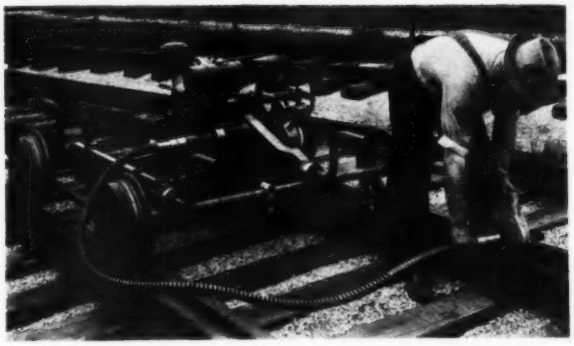
The Toggle-Action Tongs

New Short-Swing Locomotive Crane

MEETING the problems of clearance limits in a novel way, the Industrial Brownhoist Corporation, Bay City, Mich., has just completed a new locomotive crane for the New York Central, which will be used for maintenance of way work on its New York division. This crane differs from the standard locomotive crane in that the boiler, water tank, and coal bunker are separated from the hoisting machinery and are mounted directly on the car body and enclosed in a stationary cab. The hoisting engines, drums, controls, etc., on the other hand, are mounted on the turntable and enclosed in a separate operator's cab with a tail that conforms to the arc of a circle so that it does not extend beyond the side clearance limits when the boom is swung to either side. This permits the crane to be operated on one track without fouling equipment on adjacent tracks.

The Front of the Fixed Cab Houses The Rear of the Swinging Cab

The forward end of the fixed cab has a concave shape conforming to the convex tail of the swinging cab, thus insuring maximum utilization of the available space on the deck. This crane is equipped with a 40-ft. boom, and has lifting capacities approximating those of a 15 to 20-ton machine. The boom heel of the crane has been raised to obtain the maximum reach when working over the end of a gondola car. The assembly is complete with air compressor, air brakes, and all A.A.R. standard equipment specifications.



The New Light-Weight Grinder

F-M Compressor Has Diesel Power

FAIRBANKS, Morse & Co., Chicago, has developed a diesel-powered air-compressor with a capacity of 210 cu. ft. of air per minute, for which a flanged wheel mounting has been made available so that it may be adapted to railway maintenance work. This unit has a length over-all of 164 in., a width of 61 in. and a height from the top of the rail to the top of the radiator cap of 63 in. It is available in self-propelled and non-self-propelled types, which have shipping weights of 7,830 lb. and 7,580 lb., respectively.

This compressor is powered with a four-cycle, six-cylinder, medium-high-speed diesel engine, which embodies electric starting, individual Bosch fuel injection pumps and nozzles, removable cylinder liners, individual cylinder heads, and precision-type main and connecting rod bearings. The engine is designed to permit ready inspection and servicing.

The compressor is designed to operate at full engine speed and is direct-connected to the engine. It has six compressor cylinders, an operating speed of 1,200 r.p.m., a piston displacement of 300 cu. ft. per min. and, like the engine, embodies a force-feed lubricating system to all bearings.

On the self-propelled type the control levers are located at the front of the unit so that the operator has a clear view of the track ahead. At the rear of both types is a large tool box which is streamlined to harmonize with the front end. Removal of the compressor from the track is accomplished with the aid of a screw-type lifting jack.

New Nordberg Light-Weight Grinder

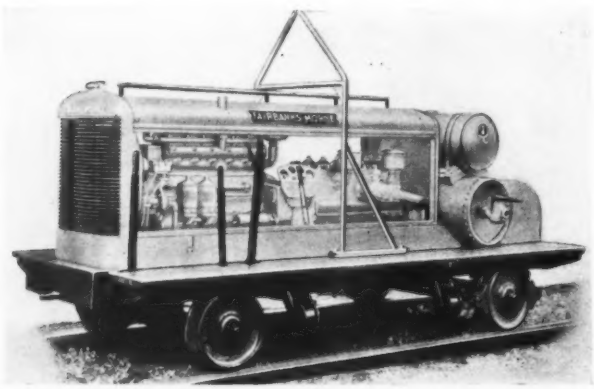
A LIGHT-WEIGHT DG grinder, developed primarily for use on busy lines where the machine must be removed from the track quickly, has been placed on the market by the Nordberg Manufacturing Company, Milwaukee, Wis. This new model is similar in many respects to the heavier CG grinder (described in the February, 1936, issue) but has been equipped with a single-cylinder four-horsepower gasoline engine for the purpose of effecting a material reduction in the weight of the machine and making it more convenient for use.

In addition to the radial wheel for grinding rail ends, this model is offered with a flexible shaft to power various attachments which are designed for particular rail-grinding jobs. By means of this flexible shaft the grinder can be used for rail-end slotting, grinding frogs and switch points, removing flow from stock rails, grinding flangeways at highway crossings, and other uses.

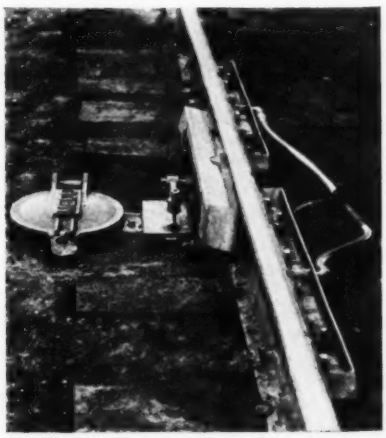
Rail and Flange Lubricator Improved

DURING the last year Type MB Meco rail and flange lubricators have been improved by using lubricant applicators or wiping bars of new design. The wiping bars are now set lower on the gage face of the rail and the lubricant discharge notches are wider. This is said to assure more effective application of the grease around the wheel flange.

For yard and terminal rail lubrication, the yard type MB Meco lubricator, shown in the illustration, may be installed with all parts within 28 in. of the gage face of the rail. The lubricant container is located between the ties and projects little beyond the tie line, but is always inside the car body line. The top of the container is set level with the top of the ties, or slightly higher if desired. This method of installation eliminates the universal shaft used in standard type



Left—The Compressor Is Driven by a Four-Cycle Six-Cylinder Engine



Right—The Yard Type MB Meco Lubricator

MB Meco installations. Downward movement of the wheel tread-operated ramp actuates the lubricant pump at the container by means of a pair of levers connected to an adjustable push rod.

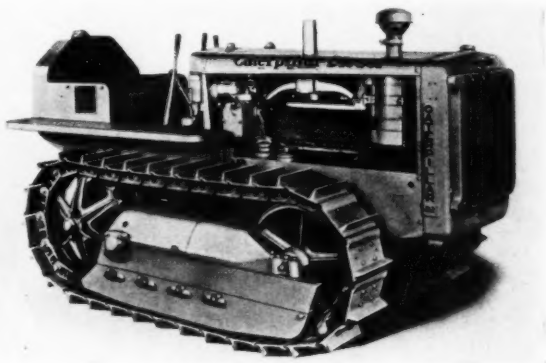
It is claimed that rail creepage, wave motion and lateral movement of the rail do not affect the operation of the lubricator. Relative changes in level between the rail and the container are taken up by adjustment of the length of the push rod. Both the yard Meco and the standard MB Meco lubricators may be easily adapted for two-rail lubrication at slight additional cost. Two-railer Mecos, as such machines are known, are recommended for yard and terminal rail lubrication.

New 25-Hp. Diesel Caterpillar

THE Caterpillar Tractor Company, Peoria, Ill., has announced a new track-type machine—the Diesel D2—comprising a Diesel-powered tractor of a size that is believed to be adapted especially to maintenance work. The new tractor develops 25.5 hp. at the drawbar and will handle appropriate blade graders, smaller maintenance machines, roll-over scrapers, and similar loads. On this kind of work, under average conditions, the engine is said to use only 1¼ gal. of fuel per hour.

The Diesel D2 tractor has a four-cylinder, four-cycle engine, with a 3¾-in. bore and a 5-in. stroke. To insure quick starting of this engine, even under adverse conditions, an independent two-cylinder horizontally opposed four-cycle gasoline engine is supplied. This engine, with a bore of 2¾ in. and a 3-in. stroke, delivers 10 hp. at 3,000 r.p.m., providing ample power to turn the Diesel motor against full compression until the required starting temperature is reached. Another all-weather feature is the hot-water manifold, mounted on the front side of the fuel filter housing, which keeps the Diesel oil at proper temperature regardless of what climatic or operating conditions may be.

A unique feature of the Diesel D2 engine is the twin radiators, one for cooling the water and the other for cooling the lubricating oil. With increased leverage on the steering levers this tractor is said to be an unusually easy steering tractor, flexible in operation and easily maneuverable. It is equipped with heavy-duty, slow-speed steering clutches, and with a hand-operated master clutch lever. The entire tractor is said to be exceptionally accessible for maintenance.



The New 25-hp. Diesel Tractor

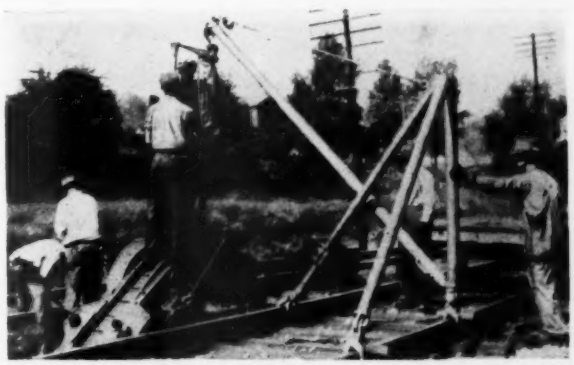
A Demountable Stiff-Leg Derrick

A DEMOUNTABLE derrick for handling its mole ballast cleaners, but which railroads have also found useful for the lifting of other loads up to 3½ tons, has been developed and placed on the market by the Railway Maintenance Corporation, Pittsburgh, Pa. The device embraces only nine pieces, including the hoist, and weighs 650 lbs. The heaviest piece can be handled by two men, and it is said that the derrick can be erected ready for use by three men in two minutes.

The Derrick May Be Loaded on a Car With the Mole

Of the stiff-leg type, the derrick consists of four main elements, a mast, two legs or stays, and a boom, all of seamless steel tubing with cast electric-steel fittings at the ends. The mast and the stays are attached to the rails by wedge clamps and the cross stay is equipped with a threaded sleeve so that its length can be adjusted to set the mast in a vertical position, regardless of the amount of superelevation of the track. This sleeve joint is insulated so that the derrick does not interfere with track circuits.

The boom has a fork at the lower end to fit a collar at the foot of the mast, while the upper end has a fitting that embodies two loops, one for the attachment of the hoist and the other to receive the hook on the end of a cable that secures it to a swivel collar at the top of the mast. This cable is of such length that the derrick is



Using the Derrick to Lift a Mole

given a fixed lifting radius of 9½ ft.

Lifting is done manually with a 4½-ton ratchet chain-hoist, designed to raise the lifting hook from a height of 1 ft. above the rail to a position 6½ ft. above the rail. The outfit also includes a spreader or equalizer bar with two chains at each end that are provided with hooks.

As shown in one of the illustrations the parts of the derrick are readily loaded on the push car with the mole. The only tool required for the erection of the derrick is a sledge hammer or a spike maul.

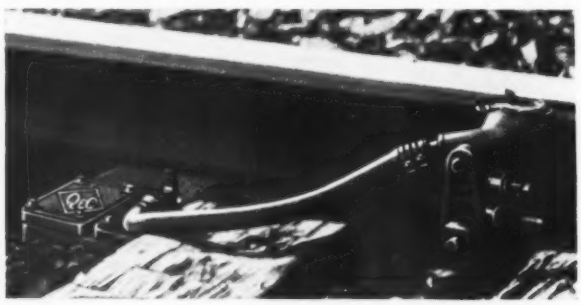
New Q & C Lubricator

THE Q & C Company, New York, is introducing a new rail and flange lubricator, designated as the Q & C Black Streak, which is said to effect a uniform distribution of grease to the flange contact surface of the high rail on curves. It embodies a new design of forced feed mechanism and a novel form of distributing nozzle.

The mechanical forced feed pump is a self-contained unit, located in the grease tank between the ties, directly under the base of the rail. The pump is located in the bottom of the tank, while directly above it is a housing for a vertical adjustable shaft that projects from the top of the grease tank and is held in contact with the under side of the rail base by means of a coil spring in the housing. Interposed between this shaft and the top of the pump plunger is a double toggle that transmits the movement of the rail to the plunger and effects a multiplication that gives the plunger a stroke at least 2½ times the vertical movement of the rail.

From the pump the grease is delivered through a flexible tube to a nozzle that is held against the gage face of the rail head by a hinged support that is clamped to the base of the rail. The outlet in the nozzle is so located that the grease forced from it is picked up by the wheel flanges, the claim being made that this takes place regardless of whether the flanges are running close to the rail.

Among other advantages claimed for this lubricator are that it is easily and quickly installed with no drilling or grinding required, that the motion of all moving parts is slow and that they are all well lubricated.



A Black Streak Lubricator in Service

New Electric Concrete Vibrator

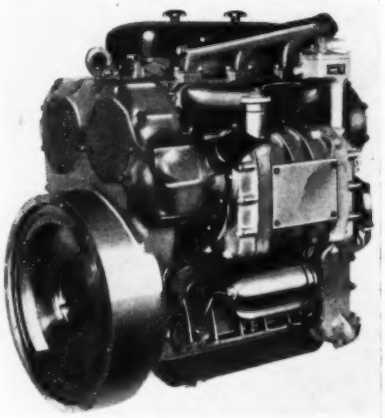
A NEW electric motor-driven, internal type concrete vibrator has been developed by the Syntron Company, Homer City, Pa., in which the standard equipment consists of three pieces: (1) An electric drive motor mounted on two small wheels, (2) a variable length of flexible shafting, and (3) the vibrating tool which is immersed in the concrete.

The Vibrator Complete with Its Motor

The electric motor, which is mounted on small steel wheels, as illustrated, is of the repulsion-induction type and operates on both 110 and 220 volts, single phase a-c. Its built-in gear box contains molded gears that increase the driving speed to 7,200 r.p.m. The flexible shaft is metal armored and available in 7-ft. and 12-ft. lengths which can be coupled together to give desired lengths up to a maximum of 31 ft. The vibrating tool is offered in two diameters: 1⅝ in. and 2⅝ in. It comprises a steel cylinder within which is an out-of-balance shaft which, rotating at high speed on heavy ball bearings, sets up a vibration that penetrates in all directions through the mass.

General Motors to Build Small Diesel Engines

THE General Motors Corporation has completed a plant at Detroit, Mich., for the production of a new line of small, light-weight, two-cycle Diesel engines, designed for a wide range of industrial purposes, including their use as the power unit for such equipment as tractors, electric pumps, generators, air compressors and work equipment. These small Diesels, which follow the same general design as the larger engines manufactured by this company, are designated as the 71 series and include one, three, four and six-cylinder units, all with 4½-in. bore and 5-in. stroke. These units will range from 22 to 165 hp. at 2,000 r.p.m., with normal industrial ratings from 15 to 90 hp. at approximately 1,200 r.p.m. The company plans immediate production of the three, four and six-cylinder sizes, with industrial ratings of 45, 60 and 90 hp., respectively.



The New Diesel Engine in the Three-Cylinder Size

The application of the two-cycle principle has resulted in a limitation as to weight and size such that these Diesel units have practically the same overall dimensions as four-cycle gasoline engines of the same power. Among noteworthy features of the design is the application of the uniflow principle whereby the products

of combustion are exhausted through valves in the cylinder head, which open just as the air intake ports are exposed at the end of the down stroke, thereby effecting a straight-line intake and exhaust movement that insures a minimum of mixing. Attention is directed also to new types of unit fuel injector mounted on each cylinder head, which is responsible in part for the claim made by the manufacturer, that these engines will operate effectively on commercial furnace oils now generally available.

Among other advantages to which attention is directed is the fact that the engines of different sizes differ only as to the number of cylinders, and that the accessories on the various units are essentially alike, while permitting a considerable flexibility in the location of the accessories on the engines. All sales of the 71 Series Diesels will be handled through the Diesel Engine Division of the General Motors Corporation, with headquarters at Cleveland, Ohio.

Shovel Crane Adapted for Railroad Ditching

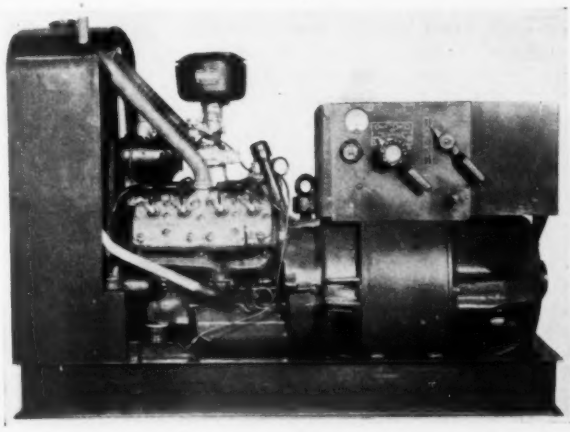
IN THE new American Gopher Ditcher, several of which have been placed in service on eastern railroads, a number of special modifications in design have been made by the American Hoist & Derrick Company, St. Paul, Minn., to adapt its "American Gopher" shovel to ditcher service. The machinery deck of the crawler-mounted shovel crane has been raised to a height of 3 ft. 2 in. above the crawler treads by placing a spacer ring under the bullgear. This allows the machine to swing over the side of a low-side gondola car when working on car decks in ditching service. To insure that the machine will not foul cars on adjacent tracks, the rear corners of the body have been trimmed so that the machine projects only 6 ft. 6 in. from the center line of track when swung 40 deg. off the center line. Mechanical stops are provided to prevent the machine from swinging more than 40 deg. A lever convenient to the operator disengages these stops when it is desired to swing the machine in a full circle for service on the ground, as shown in the accompanying illustration.

Left—The Crawler Mounting Has a Marked Advantage on Soft Ground

New Single-Operator Welding Sets

A NEW single-operator d-c. welder, driven by a 60-hp. 8-cylinder automobile engine, has been placed on the market by the General Electric Company, Schenectady, N.Y. This set is light and compact, and both engine and generator are made up of standard parts. The engine is said to furnish ample power at an operating speed of 1750 r.p.m., which is equivalent to 31 m.p.h. when used in an automobile. The standard assembly includes an electric self-starter, battery, charging generator, oil-bath air cleaner, fuel pump, 10-gal. fuel tank, and vacuum speed governor. The set may also be equipped with electric slow-down control, crank-case oil filter, auxiliary 1 or 2-kw., 125-volt d-c. generator for operating lights and small motors, and a two-wheel pneumatic-tired roller-bearing running gear with a trailer hitch.

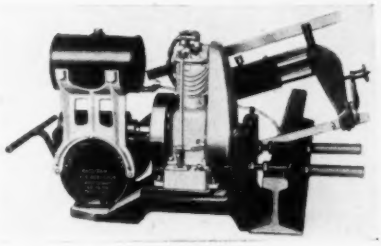
Another single-operator d-c. arc-welder motor-generator set marketed by the same company has been improved by redesigning the electric and magnetic circuits. The new design is expected to broaden the current range and to provide stability in operating at any possible setting of the current and voltage controls. Dual control, providing adjustment of both current and voltage, is said to afford a complete covering of the welding range without unnecessary duplication of settings. This model is offered in ratings of 200, 300, 400, and 600 amp., with either a-c. or d-c. motor drive, with gasoline engine, or with pulley for belt drive.



Right—The Single-Operator Welding Generator

Rail Cutter Is Complete Unit

THE Racine high speed rail cutter, product of the Racine Tool and Machine Company, Racine, Wis., is now regularly equipped with a light weight air-cooled gasoline motor, making the unit complete in itself for cutting rails in the track or at the pile, where generator or compressor units may not be easily accessible. Substantially sturdier in construction, the machine now employs the push-cut principle and the cutting speed is materially increased. It is now claimed that the machine will cut through a 100-lb. rail in from 8 to 10 min. The cuts per blade now average 15 to 20 before the cutting time increases unduly. Adjustments of the clamps for differ-

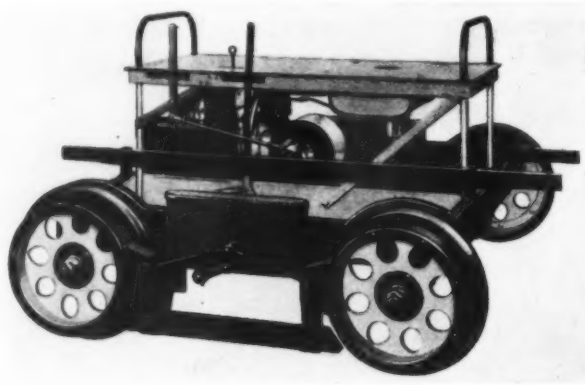


The Gasoline-Operated Saw

ent sizes of rail have also been improved. As before, the rail cutter is also available with electric motor or air drive.

Buda One-Man Car

A NEW one-man motor car, designated as Model 120, has been placed on the market by the Buda Company, Harvey, Ill. Noteworthy among the features of this car are rubber pedestal-type axle bearings which are said to eliminate jars due to rail joints and rough track; cone friction transmission which is mounted integrally with the engine; exhaust cooling, in which the velocity of the exhaust gases induces a draft of air to flow between the engine cooling fins; metal-faced equalizing brake shoes mounted on rail skids; all-steel frame and tool trays; and light weight, the total weight of the car, fully equipped, being 420 lb.



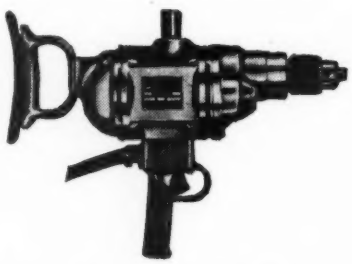
The New Buda One-Man Motor Car

Each tool tray and adjacent side members of the car are formed from a single piece of sheet metal. In fact the frame consists of only four members—two end channels and the two tool trays, which are welded together. The tool and battery boxes of the car are of steel and are located on each side of the frame in such a manner as to form guards for the brake rigging. One lever controls both forward and reverse movements of the car, the only other controls being the brake lever and the throttle control. The latter is the only lever on the seat deck so that there is a minimum of interference with the available seat space. The seat deck is of pressed wood and its steel tube supports are extended above the deck to form grab irons. Removal of the car from the rails is facilitated by the fact that the rail skids between the wheels are carried to a point only one inch above the tops of the rails. Oak extension lift handles are provided.

The 120 motor car is powered with a Model I-120 horizontal two-cylinder, opposed, four-cycle engine developing 4 hp. The engine is free running, is started with a crank and is equipped with a counter-balanced crankshaft mounted in ball bearings. Fourteen-inch, wood-center wheels are provided and each axle has one free-running wheel. The axles are 1¼-in. in diameter and are made of heat-treated steel. Some of the more important dimensions of the car are as follows: Length over-all, 51½ in.; width over-all, 64⅜ in.; seat length over-all, 42⅝ in.; seat width, 20 in.; tool-tray length, 42-13/16 in.; tool tray width, 17-13/16 in.; and tool tray depth, 4 in.

New Utility Line Of Power Drills

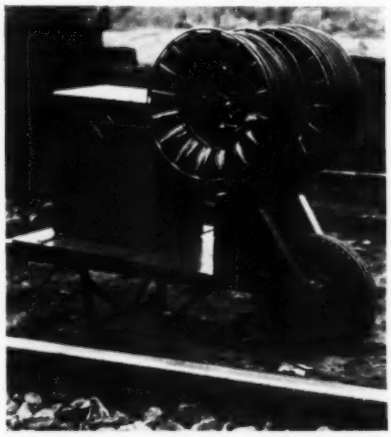
A NEW line of electric power drills suited to general utility service has been placed on the market by the Black & Decker Manufacturing Company, Towson, Md. This new line of drills comes in three chuck sizes: ⅝ in., ¾ in., and ⅞ in., weighing respectively 17 lb., 19¼ lb., and 17¾ lb. In these drills the motor, mounted on ball-bearings, transmits power to the spindle through triple-reduction gears, giving full-load spindle speeds of 175 r.p.m., 150 r.p.m., and 120 r.p.m. respectively. The chuck spindle runs in tapered roller bearings and is said to protect against wear from thrust in any direction.



The New Utility Drill

New Photo-Electric Track Sentry

THE Q and C Company, New York, has developed a "track sentry" a self-contained automatic signal device for warning track and bridge crews of the approach of trains or cars and thereby eliminating the necessity for "look out" men. This device is completely independent of all track signal circuits. The point from which the signal is operated can be as far distant from the location of the crew to be protected as one mile, and it is possible to provide either one-way or two-way protection on one, two, three or four tracks.



The Cable Is Wound on Two Reels

A sentry consists of a Weston photronic cells operating a Weston sensitive relay. The sentry is placed in the center of the track facing the sky so that the cell is constantly energized during daylight hours and maintains a closed circuit in the relay. The sentry (or sentries) is connected, by means of insulated double conductor wire of small diameter to an auxiliary relay located at the point of work. This relay operates the signal circuit in which are connected a small six-volt storage battery and a six-volt motor-driven siren. When the cell at any one of the sentries is darkened by the passing of a train or motor car the control circuit is broken and the signal-operating circuit is thereby closed, causing the siren to be sounded and giving positive warning

to the crew. When the siren is shut off, which must be done manually, the device is automatically reset for action.

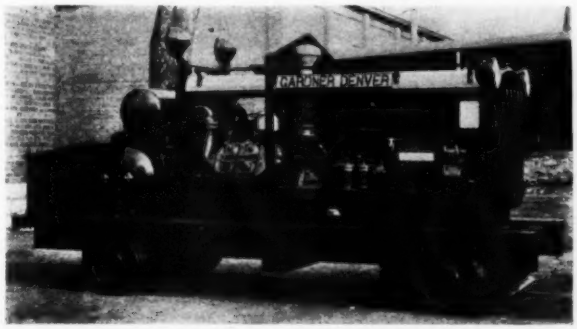
The siren, battery, and relay mechanisms are mounted on a pneumatic-tired wheelbarrow for ready transportation along the roadbed. The two one-mile lengths of conductor are wound on reels which are mounted on the carriage, and can be unreeled along the track by hand, to any desired distance from the gang, in both directions if desired. Since the control circuit is constantly energized by the photo-electric cells, any disturbance in this circuit, such as the tampering of a trespasser, wire breakage, or loose connections, will cause the siren to sound immediately. A cloudy or rainy day, however, will not impair the efficiency of the operation of this warning device; it will also function with an inch or two of snow covering the signal cells.

A siren was selected for the warning signal because of its ability to penetrate the noise of track tools, riveters, etc. It is also contended that the men now employed as lookouts may be diverted into more productive labor.

Improved Compressor for Tie Tamping

THE Gardner-Denver Company, Quincy, Ill., has incorporated several improvements in its model 210 ft. compressor that is adapted especially for railway tie tamping. This compressor comprises four low-pressure cylinders with 5¾ in. bore and two high-pressure cylinders of 4¾ in. bore, all with a 5-in. stroke, and has a capacity of 210 cu. ft. of air per minute, sufficient, it is asserted, for the operation of 16 tamping tools at once.

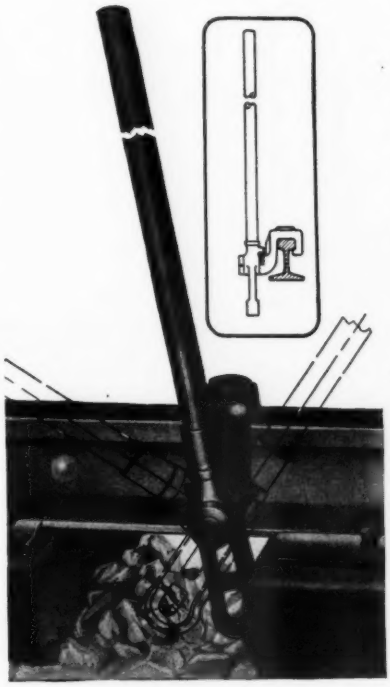
The power unit in the compressor is a Caterpillar D-8800 Diesel engine capable of developing a maximum of 80 hp. and has a sustained running capacity of 60 hp. Compressor unit and engine are mounted on a 4-wheeled truck which is propelled by an air motor and equipped with tractor headlights front and rear.



The Compressor Develops 80 h.p.

Improved Tie-Spacer

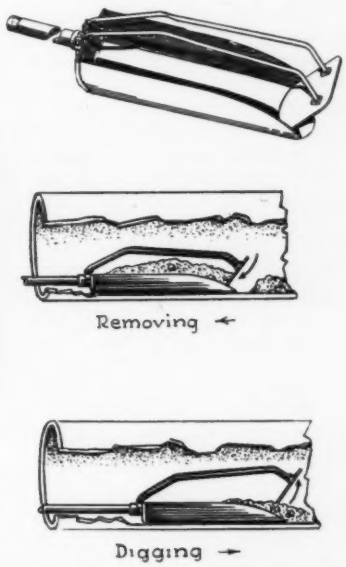
IMPROVEMENTS in the Simplex G-Y tie spacer have been made by Templeton, Kenly & Co., Ltd., Chicago, with an eye to reducing weight and increasing ease and efficiency of operation. The bracket upright formerly grasped by the operator with his left hand has been discontinued in the new model as it had increased the weight of the tool by five pounds and because the operator was believed to be more effective when using both hands on the tie lever extension. The bracket itself, which grips the head of the rail when pressure is applied on the lever in moving ties, is now built with safety stops that limit the arc through which the lever may operate to 45 deg. on either side of the vertical. The tie spacer can easily be applied to or removed from the rail by merely tilting the bracket. Weighing only 20 lb. it is easily carried and can readily be moved from tie to tie by sliding along the rail.



The Improved Tie-Spacer

Develops Device for Cleaning Culverts

THE Monarch Road Machinery Company, Grand Rapids, Mich., now has on the market a device for cleaning culverts, which is known as the Morco culvert cleaner. This cleaner, which is designed for use in culverts of 10 in. or more in diameter, consists of a formed scoop which carries at its forward end a vertical spade or hoe supported by two arms that extend to the rear of the scoop where they are fastened with hinge connections. The spade is so inclined slightly from the vertical that it rotates upward about its hinged connections when the scoop is forced into the material to be removed; thus during the forward movement the spade "rides" on the surface of the waste material. Conversely, when the scoop is being withdrawn the spade is forced down through the waste material and prevents it from sliding off the scoop.



Sections of Pipe Showing the Manner of Use of the Culvert Cleaner. In the Middle View the Scoop is Being Forced into the Material; in the Bottom View It Is Being Withdrawn

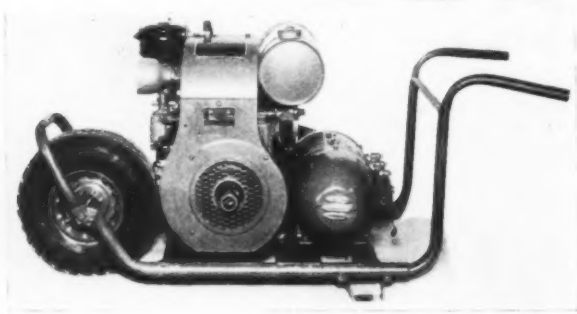
Constructed of 16-gage alloy steel,

the cleaner is 18 in. long and 6¾ in. wide and is rounded on the under side in order to adapt it to use in circular culverts. It is used with a handle (not furnished), consisting of joined sections of ¾-in. galvanized pipe which may be extended to any desired length. Where individual requirements render it desirable, special sizes of the cleaner may be obtained.

Two-Tool Electric Tamper

THE Electric Tamper & Equipment Company, Ludington, Mich., has added a two-tool spot tamping outfit to its line of tie tampers. The power unit is light in weight, consisting of an air-cooled gasoline engine driving a 1¼ kva. generator having capacity for operating two electric tie-tamping tools. The power unit is mounted on a pneumatic-tired wheelbarrow, allowing it to be rolled along the shoulder of the track, the wheel being of such size that it can be readily pushed over rough stone or other obstructions. Because of its small size and weight, the unit can be readily transported to and from the work. The total weight of the power unit and carriage is 260 lb. and the base area is 19 in. by 40 in.

Tamping tools are equipped with special spotting blades designed to be effective in all types of ballast. This equipment is designed particularly for gangs consisting of a foreman and two or three men. In operation only three men are required, two to operate the tamping tools and the third as a general utility man to nip up the ties, throw in additional ballast and move the generator unit when necessary. The tampers are provided with sufficient cable to permit the power unit to be moved forward without disturbing the men operating the tools. It is said that it has been found practicable to smooth the surface on as much as one-half mile of track per day with three men.

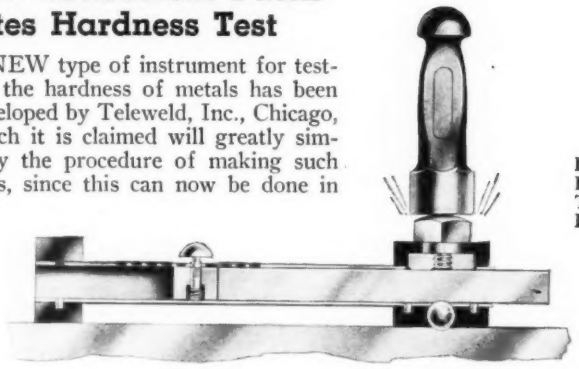


The Power Unit Can Be Readily Transported

It is said that the power unit will operate for six hr. on 2½ gal. of gasoline and that it develops standard commercial current, thus making it possible to operate drills, saws, wrenches, grinders or any other tool within its rated capacity. The governor-operated throttle makes it possible to generate a steady current for lighting and the unit will operate a large size flood light. This equipment is built to the same standards as the larger tamping outfits manufactured by this company.

New Instrument Facilitates Hardness Test

A NEW type of instrument for testing the hardness of metals has been developed by Teleweld, Inc., Chicago, which it is claimed will greatly simplify the procedure of making such tests, since this can now be done in the field, remote from laboratory facilities, eliminating the necessity for dismantling the parts to be tested, for shipment to the laboratory. The instrument was designed originally for the purpose of testing and controlling the hardness of welds made in the process of building up rail ends. It is said that it was so successful for this purpose that it became apparent immediately that it is adapted for a wider range of applications.

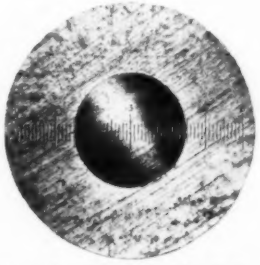


How the Hardness Tester Is Used

Among the features claimed for this instrument are simplicity, compactness, light weight and ease of manipulation. It consists of a metal tube supported in a soft-rubber head and a rubber spacing block, the purpose of which is to hold a metal bar of known hardness. An anvil in the rubber head rests directly on the bar, below which an impression ball is held securely in a narrow aperture in the base of the head in such a way that it comes in direct contact with both the bar and the metal to be tested.

Separate from the Telebrineller, as the instrument is called, but forming an essential part of the testing outfit, there is a microscope which contains a glass plate in its focal plane, upon which is etched a scale divided to tenths of a millimeter. Placed at the top of a cut-away section near the base of the microscope is a mirror which reflects light onto the impression made by the ball, bringing it out so clearly that the diameter can be read accurately to one-half of a division. The remainder of the outfit includes a slide rule, extra test bars and impression balls, and a carrying case. The weight of the complete outfit is 6½ lb., and the overall dimensions of the case are 13¾ in. by 8⅝ in. by 2¾ in.

To make the test, a bar of known Brinell hardness, approximately that of the metal to be tested, is inserted in the metal tube, and the instrument is held so that the ball is in contact with the specimen at the spot to be tested. The anvil is then struck a sharp blow with a 3 to 5 lb. hammer. The force of the blow does not become a factor, except that it must be sufficient to produce a well-defined



The Impression Made By the Ball as Seen Through the Microscope

impression. The impact is transmitted equally from the anvil to the bar and through the ball to the surface of the metal under test. Since the impact is applied equally to the bar and the specimen, the areas of the impression formed by the ball will be in direct ratio to the respective hardness of the two metals, and these areas will be in direct ratio to the squares of their diameters.

When the diameters are ascertained, since the Brinell hardness number of the bar is known, the hardness of the metal under test is determined by solving the equation.

$$\text{BHN of specimen} = \frac{(D)^2}{(D_1)} \times \text{BHN of bar}$$

in which

BHN = Brinnell Hardness number
D = diameter of impression in bar
D_1 = diameter of impression in specimen

The calculations required to solve the equation are simplified by the use of the slide rule.

According to the manufacturer, the Telebrineller or its use is not affected by weather or temperature, while it is also claimed that no special training or experience is required to operate it accurately, since its operation and the subsequent calculations are simple. It is also said that by moving and turning the bar to utilize the full length and all four faces, a total of 80 impressions can be made before the bar must be discarded.

Power Take-Off for Truck Welder

THE Hercules Steel Products Company, Galion, Ohio, is now marketing an electric arc-welding outfit mounted on a highway track chassis and operated from the truck motor by means of a power take-off. A number of these units are in service on several eastern lines, where they are being used in the repair of trackwork. For the use of one of these lines, a special truck body has been developed, which accommodates a 300-amp. welding unit and a rail grinder. The power take-off used, which is known as the Model D-700 split-shaft take-off, is said to transmit the full power of the truck motor to the welder.

The engine of the truck is equipped with a governor so that when the welding unit is in use the engine operates at 1,500 revolutions per minute, at which speed it develops a brake horsepower of 42. After the truck has been used on a welding job and before it is operated on the road, the engine governor is disengaged. By means of an idling device attached to the truck motor, the latter is made to idle when the operator is not welding.

Buda-Hubron Earth Drill

A NEW model earth drill that is adapted particularly to deep hole drilling, has been developed by the Buda Company, Harvey, Ill. The use of this drill is recommended for the excavation of holes for concrete foundation piers or for the preboring of holes for piles. Special attention is called to its application where falsework piles for underpass projects must be driven through embankments with adequate penetration into the ground beneath. It is claimed that in average soil this new tool can drill a hole 20 ft. deep in less than 30 min.

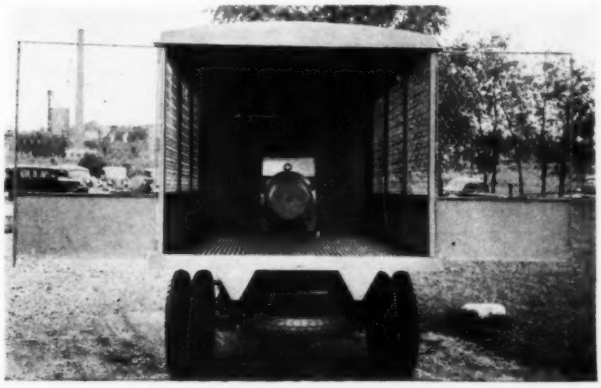
The Buda-Hubron earth drill, as it is named, is a complete unit, with its own gasoline engine. It can be mounted on any standard 1½-ton truck or on a railroad push car, being held to the truck floor by four bolts. It may also be mounted to swing on a turntable, as shown in the illustration. The drill proper is mounted on a sub-base which is adjustable 15 deg. in any direction to assure perpendicular holes when the truck is standing on rough or uneven ground.

The engine is provided with two clutches, one to revolve the drill, and the other to lift the drill and its load of earth from the hole. The spindle is driven through a spline, and in softer soils the weight of the spindle alone is sufficient to force the drill into the ground. In place of rack bars, two roller chains superimposed on T-bars are carried on each side of the drill spindle. These engage in sprockets which control the raising and lowering of the drill. Where harder soils are encountered, these chains can be used to put additional pressure on the spindle through a ratchet lever which places the weight of the machine and truck behind the drill. These chains are claimed to have the advantage of not clogging with dirt to the extent that occurs with solid racks.

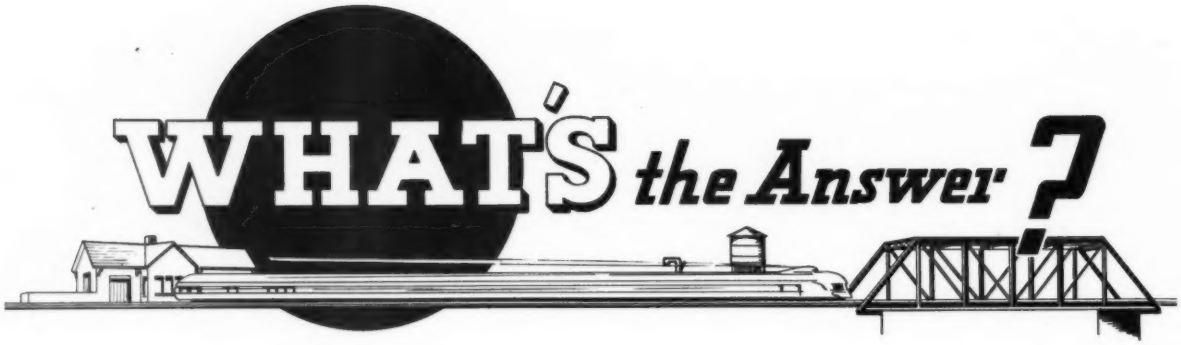
The Drill May Be Mounted on a Push Car

As it is cut loose, the dirt is forced up through a check plate to the top of the drill helix. When the drill has cut a load of about 18 in. of dirt, the spindle is stopped, the lifting clutch is engaged, and the drill with its load of dirt is raised to the surface. The weight of the dirt closes the check plate and prevents the loose earth from falling back into the hole. On reaching the top, the lifting clutch is automatically released and the brake engaged which holds the spindle from dropping back into the hole. The rotating clutch is then engaged and the whirling drill throws off its load of dirt around the hole. The drill spindle is then lowered back into the hole and the procedure continues until the hole is the required depth.

The standard drill is capable of drilling holes to a depth of 24 ft. and up to a diameter of 30 in. The machine can be furnished on specifications for holes up to 50 ft. deep; drill sizes ranging from 13 in. to 30 in. can be obtained.



The New Fairbanks, Morse Diesel-Powered Compressor



Best Floor for Trucking

What is the best floor for freight-transfer platforms and freight houses, with particular reference to trucking? Why?

Prefers Maple Flooring

By A. T. Hawk
Engineer of Buildings, Chicago, Rock Island & Pacific, Chicago

It has been my experience that heavy maple flooring lasts longer and requires less maintenance than any other type of flooring that is adapted for use in freight houses where there is heavy trucking. Maple flooring 1⅛ to 1¼ in. thick, tongue and grooved on both sides and ends, and laid over a substantial rough floor that has little spring in it, will last almost indefinitely, even under heavy trucking. We have several such floors that have been in service for 40 years, and as yet have required little maintenance. Owing to the present high cost of good maple flooring, we have, during recent years, been using square-edge factory flooring.

It has been my experience that maple flooring does not stand up when exposed to the elements, although it is used in exposed places by some roads. It is excellent for a protective floor, as in a freight house, but is not as satisfactory for a transfer or island platform, where the surface is alternately subject to rain and the sun's heat. Long-leaf yellow pine will stand the weather better, but it is also getting to be high priced, and lumber of good quality is hard to obtain.

Any single-thickness trucking platform should be laid with plank that was 3 in. thick before it was surfaced. We invariably use creosoted lumber for the frame of our platforms, but not for the decking, since the creosote might damage many of the commodities that pass over them. Recently, yellow pine treated with ZMA and Wolman salts has come onto the market and these treatments should extend materially the life of the decking.

In our freight houses, if the cost will be within reason, we always fill in between the outside walls and construct a concrete floor. This makes a good trucking surface when first laid, but the surface eventually becomes rough, particularly around cracks, and it is quite difficult to patch worn places. If the filling has been properly compacted and the floor is of the proper thickness and has expansion joints, a concrete floor is generally economical and has the added advantage of being fireproof and of being able to support any load that is likely to be imposed upon it.

Asphalt mastic makes a good floor, provided the ingredients are selected for quality. It has the disadvantage that it tends to sweat and accumulate dirt, after which the surface becomes unsatisfactory for trucking.

Requires Study

By C. Miles Burpee
Research Engineer, Delaware & Hudson, Albany, N. Y.

Before a decision is reached as to the type of flooring to be installed, a thorough study of the kind and amount of trucking and of the trucks, is essential. Poorly designed, antiquated or inadequately maintained trucks or those that are unsuited to the service, may destroy a costly surface in a short time. These are matters for correction before proper consideration can be given to the selection of the flooring material.

A good mastic of selected mineral aggregates, bonded with asphalt, makes a smooth floor that does not buckle with atmospheric changes. It resists grinding and rippling under

Send your answers to any of the questions to the What's the Answer editor. He will welcome also any questions you wish to have discussed.

To Be Answered in May

1. What effect, if any, does the size of tie plates have on the life of rail? Why?

2. What methods should be employed to repair leaks in a pitch and gravel roof?

3. What details should be given attention when using tie adzers? What is the importance of each?

4. Should elevation blocks on open-deck timber trestles on curves be placed on top of or beneath the ties? On open-deck steel spans? Why? If on top, what means can be employed to cant the low rail to conform to the superelevation?

5. Is there any advantage in applying switch-point guards at yard turnouts? Why? If so, should they be applied at all turnouts?

6. Is it practical to use cast iron pipe for suction lines? If not, why? If so, under what conditions?

7. Should anti-creepers that have been removed during tie renewals be replaced against the new ties or against adjacent ties that have not been disturbed? Why?

8. Is it practicable to paint interiors by the spray method? If not, why? If so, what methods and precautions are necessary that are not required for brush painting?

traffic, as well as the action of many acids and chemicals. It has good traction, is not slippery, is sanitary, fire resistant, waterproof, resilient and non-abrading. Its elastic and thermal-insulation properties are about two-thirds those of such hardwoods as oak, maple and gum. A substantial base is essential, for a mastic floor does not of itself have any structural strength.

There are many mastics on the market, and it is essential, if good results are expected, to use material from a reputable manufacturer and require strict adherence to plans and specifications covering the installation. Mastic is mixed on the job, so the quality of the floor will also depend on the experience and skill of the gang doing the work.

Planks or slabs made of asphalt, mineral filler and tough fibre, densely compressed, may be obtained in various thicknesses and are relatively easy to apply. When properly installed over a substantial and smooth base, they form a good surface which has many of the essential characteristics of good mastic. However, if a waterproof job is required, waterproofing must be applied beneath it. A protective membrane is also required when the plank is applied over creosoted lumber.

Creosoted gumwood gives excellent results and will withstand heaviest service when exposed to the weather or when used inside buildings. Tongue and grooved maple makes an excellent floor for freight houses and instances can be cited where it has served for many years with only minor repairs.

All of the foregoing materials have given satisfactory service under varying conditions. The type that is best depends in some measure upon local conditions, and this consideration includes economy as well as service.

Underwater Inspection

How does one make an inspection of the underwater portions of masonry structures?

Should Include Soundings

By George E. Robinson
Assistant Engineer, Cleveland, Cincinnati, Chicago & St. Louis, Cincinnati, Ohio

In general, below-water inspections are really foundation inspections. The primary interest is the elevation of the ground with respect to the bottom of the footings, and its character. The safe depth of ground above the footing depends on what the footing sets on as well as on the character of the surrounding ground. The criterion is that active water should never be allowed to reach the foundation under the masonry. With this in mind, the depth is a matter of judgment in each individual case, sometimes reaching astounding figures. For instance, I know of a bridge where the flow-line material is sand, and a recent runoff scoured it to a depth of 32 ft., but filled back to the original depth as the velocity of flow subsided. This same action takes place in varying degree in all washable materials, indicating that a subaqueous inspection of masonry should be made when the stream velocity is highest in all cases where the material in the bed of the stream is movable under flood conditions. Perhaps Nature planned it that way to make the bridge inspector's life less humdrum.

It should be noted that maximum velocity does not always coincide with maximum height of the stream. Again, wash may be expected to continue as long as the velocity exceeds that required to move the bed material, for which reason the inspection should be continued as long as conditions are favorable for wash.

Methods for making inspections call for some ingenuity, since they range from a spike on the end of a string to a deep-sea diver. If the depth is not prohibitive, a light metal rod or a metal-tipped wooden pole is the most satisfactory, since one is able, by "feel," to identify masonry, timber, stone and soil. In fast water, a metal rod can be used to considerable depths. In use, the rod is thrown harpoon fashion. With practice it is possible to select an angle of incidence that will bring the point of the rod to the ground line at the instant that it is borne to the vertical position. Markers at convenient intervals facilitate accurate reading. All inspections should include soundings across the stream at the bridge and immediately downstream.

Telephone May Aid

By E. C. Neville
Bridge and Building Master, Canadian National, Toronto, Ont.

Underwater inspections are often neglected because of the difficulty of making them, because of the lack of facilities for doing this and sometimes from failure to appreciate their importance. By the time distortion or settlement indicates that trouble is brewing, the damage below the water line may be so advanced that replacement is the alternative to collapse.

Scouring is the most frequent source of underwater trouble. It may occur in connection with floods and their attendant higher velocities, from changes in the direction of the current, caused by the introduction of some obstacle in the stream, such as piers for another bridge, the installation of a culvert, the construction of a landing dock, etc.; or as the result of an accumulation of drift or ice around the structure. Any such obstruction should be sufficient warning to indicate the importance of frequent inspections to determine whether changes are taking place in the contour of the river bed.

Shattered stones usually result from overloading. When they occur below water they constitute an added hazard, as do horizontal joints from which the mortar has been scored, leaving the stones loose so that they can be shifted by the impact of ice or heavy debris. While sounding rods or sounding lines will ordinarily give ample information about scouring and its relation to footings, particularly if "as constructed" plans are available, this method is of little practical use in ascertaining the condition of the masonry. It is almost impossible to tell by blind probing whether the mortar between the joints is in good condition or to discover shattered or missing stones.

For these reasons, a diver affords the best means of obtaining reliable information concerning the condition of the masonry as well as definite evidence of the effects that may have been produced by scouring. This method may involve considerable expense and require the use of special equipment. Diving apparatus should always be equipped with telephones so that defects can be recorded as they are found. Its use eliminates the necessity for the diver coming to the surface at short intervals to report.

Gaging Against Irregular Gage

When renewing rail on track having irregular gage, should the first line of new rail be gaged to the old rail? Why? If not, how should it be gaged?

Not on Tangents

By C. W. Baldridge
Assistant Engineer, Atchison, Topeka & Santa Fe, Chicago

When renewing rail on tangents, the first line of rails should not be gaged closely to the old rail if the old rail has irregular gage, since close gaging will perpetuate the bad gage and kinks of the old rail, which will be indicated by corresponding defects in the line. It is better to gage the new rail at two points for each rail to keep the spikes and tie plates as nearly in their old positions as practicable. It should then be spiked in as straight a line as possible.

On curves, it is desirable to spike the first line of new rail to gage with the old rail, to reproduce the curvature accurately. However, the alinement of the curve should be checked in advance of the laying of new rail, and all change in alinement which may be necessary should be made before the new rail is laid. If this is not done, the space left for expansion may be deranged to a serious extent when the lining is done. Again, if considerable throw is to be made it may become necessary to cut a rail or two to make closure.

In general, it is advisable to relay one side of the track and allow several trains to pass over the new rail before the other side is laid and gaged to the first. All newly-laid rail is subject to some settlement, and this usually affects the gage, particularly when it is supported on canted tie plates. To sum up, gage the first line of new rail lightly to the old on tangents, then gage the second line accurately when it is laid.

Gage to Line Rail

By W. H. King
Section Foreman, Missouri Pacific, Francitas, Tex.

Unless the track is in exceptionally bad condition, the line rail will be reasonably straight and it is usually practicable to do enough lining ahead of the rail gang to take out the short kinks. If this is done and the gage rail is laid first there should be no reason why the new rail cannot be gaged to the old rail. While it will obviously be far better to have the track in first class line and gage before the new rail is laid, this is not always practicable and the plan suggested is the best substitute for the more complete preparation.

Should Not Be Irregular

By W. H. Sparks
General Inspector of Track, Chesapeake & Ohio, Russell, Ky.

The question touches a subject of prime importance in rail renewal, for failure to take the proper action under the conditions implied by the question has been responsible for much damage to both new and relaying rail. Any trackman knows that if the track is so badly out of gage that the question of how the gaging shall be done arises, both line and surface will be equally bad. It is my contention that new rail should never be laid on such track, for it is practically impossible to prevent severe damage before it can be taken care of. In other words, track that is in this condition should be given a light running surface and should be gaged and lined before the new rail is laid.

If conditions make it imperative that the new rail be laid without this preliminary work, I would gage the new rail to the old rail. Later when the surfacing is under way, I would have a bolting gang go over the joints again, working well in advance of the lining to insure that there will be no slippage in the joints as the rail is thrown to line. Selections of a foreman to lay rail on track that is in this condition becomes a matter of prime importance, for an inexperienced foreman or one of inferior ability is likely to permit the rail to become damaged in ways that can be avoided by a careful foreman.

Should Be Gaged

By Supervisor of Track

The first line of new rail should be gaged to the old rail. While this may sometimes result in irregular line, the riding effect will be no worse than it was on the old rail. Correct gage is provided at once, permitting the use of the track if it becomes necessary to close up before the other side is laid.

When laying rail on canted tie plates, the new rail usually settles inwardly under traffic, and this results in irregular gage after several trains have passed over it. It is customary to work new rail out-of-face immediately after it is laid, and this includes both gaging and lining. There is, therefore, no advantage to be gained in attempting to spike the new rail to good line rather than to set it to correct gage with the old rail.

Carrying Tools on Motor Cars

What precautions should be taken to prevent accidents when tools are being carried on motor cars?

Most Often Neglected

By J. B. Bragg
Section Foreman, Chesapeake & Ohio, Prince, W. Va.

Probably the assembling of tools on the motor car is the duty most often neglected in the haste to get the car out and started toward the day's work. A hazard to the safety, perhaps the life, of every man in the gang is created by this carelessness in what should be considered a most important duty. Jacks should be placed at the rear of the car; bars, wrenches and other straight tools at the bottom of the tool trays. Mauls and sledges should be laid flat, and shovels, ballast forks, scoops, etc., piled on top in such a way that they will not easily be dislodged. Fully as important, some member of the gang should be detailed to keep an eye on the tools while the car is in motion and examine them before the car starts again whenever it has been stopped.

Should Be Secured

By C. H. Longman
Assistant General Manager, Chicago & North Western, Chicago

A track jack should be laid in a horizontal position at the rear of the car, with the handle socket up and the base of the jack secured against the back of the tool tray or the lift rail, to prevent it from sliding off. A jack must never be placed at the front of the car. Sharp-edged tools, such as

adzes, scythes, etc., should be loaded with their edges down or otherwise protected, so that they are not exposed where a man may suffer injury from them.

Bars, wrenches, shovels and small tools should be laid flat in the tool trays, with no parts overhanging the sides. They should not be piled higher than the sides of the tool trays, and they should be secured so that they cannot fall off. Special care should be exercised to insure that bars are loaded in such a way that they cannot work forward and fall off of the front end of the motor car, as they are particularly dangerous when this happens, because of their length. All members of the crew should be alert to see that the tools do not shift into dangerous positions after being loaded; otherwise they may fall from the car or become fouled in the engine, the wheels or other moving parts.

Motor Car Must Be Safe

By Thor Monrad
Track Supervisor, Northern Pacific, Columbus, Mont.

First of all, the motor car itself must be in safe condition for service for, if not, all possible attention to the loading of the tools may be nullified. Tool trays should be provided for the reception of the tools, and tools should never be carried on a car that is not so equipped. In addition, the tools should be placed in such a way that they will not stick out over the sides or ends of the trays, and they should be secured to prevent their slipping endwise and falling off the car. Tools with sharp points or edges should have these points or edges covered with guards to prevent injury from contact with them.

Safety Depends on Loading

By W. E. Folks
Track Supervisor, Cleveland, Cincinnati, Chicago & St. Louis, Cincinnati, Ohio

Safety in the transportation of tools by motor can be obtained only by strict attention to loading and handling. First, the capacity of the car is important; second, it should be fitted with tool trays; and, third, the tools should be loaded properly. Bars should be placed at the bottom of the trays. Jacks should be placed at the rear of the car—*never* in front. A rack should be attached to the front or rear guard rail to allow picks and shovels to be stood upright, as these tools will ride better in this position; while it allows more room for the riders. Loaded this way the tools can be unloaded in minimum time and with minimum effort.

Every precaution should be taken to see that the load in balanced, for there may be danger in operating cars that are badly out of balance. There is always some hazard connected with the operation of a motor car. This hazard should be minimized in every possible way, rather than increased. To do this, however, it is important that the trackmen, the operator and the foreman use the utmost care to see that all safety rules relating to the loading of tools be carried out.

Carelessness Only Cause

By F. M. Knight
Section Foreman, Southern Pacific, Ripon, Cal.

Tools that have been properly loaded and secured do not fall off of motor cars. In other words, accidents that result from carrying tools on motor cars can invariably be traced to carelessness, and are therefore preventable. Every motor car should be equipped with tool trays, regardless of the service to which it is assigned, since some situation is sure to arise which will make it desirable to carry tools on it. These trays should be deep enough to carry a full complement of tools for the gang and should be fitted with end stops of sufficient height to insure that no tool will slide over either of the ends.

All bars should be placed in the bottom of the trays; sledges and mauls should be laid so that both bit and handle are horizontal; handles should be removed from picks so that they will nest properly in the trays; and shovels should be piled on the top. Jacks should be laid horizontally at the rear of the car, with the lever arm up and the toe of the base overhanging the car floor. Finally one member of the gang should be detailed to watch all tools while the car is in motion, to insure that they will remain in place at all times.

Preparing Surfaces for Painting

Should the old paint be removed from wood surfaces preparatory to painting? From steel surfaces? Why? What satisfactory methods can be employed?

Not in Every Case

By E. C. Neville
Bridge and Building Master, Canadian National, Toronto, Ont.

It is not necessary in every case to remove the old paint from wood surfaces when preparing them for repainting. This need be done only where the old paint has cracked, is peeling or alligatoring is in evidence. In any of these events it is impracticable to secure a smooth job of painting while, more important, the foundation for the new paint may be seriously in question.

Cracking and peeling result when the paint dries out and becomes hard and brittle, losing all of its elasticity. Obviously, it will be impossible to secure a good job by painting over such a surface, so that the only safe procedure will be to remove the old paint. Alligatoring usually results from allowing insufficient time for the priming coat to dry properly before succeeding coats are applied. While this defect does not penetrate to the wood surface, it produces an unsightly appearance and makes it almost impossible to obtain a satisfactory job of repainting, so that it is desirable to remove the old paint regardless of its physical condition.

On surfaces free from the foregoing defects, a good job of repainting can be secured if ordinary precautions are taken to insure that the surface is dry, free from dirt, in good repair and the paint materials to be applied are of good quality. Obviously, much will depend on the character of the workmanship. Many men become expert in the use of paint spraying equipment and are able to apply paint correctly. These men are novices in the use of the paint brush, and have only a vague idea of the essential principles pertaining to the preparation of the surfaces for the reception of the new paint.

I am strongly in favor of spraying paint because of its economy coupled with the ability to get as good quality work, and sometimes better, than with brushes. But the man who brushes the paint on a surface knows more about preparing it for painting than the spray man will ever learn unless he is given intensive instruction on the subject. For this reason, every paint gang should be built up with ample experience in both brush and

spray applications under the leadership of an expert paint foreman.

It will usually be necessary to remove the old paint from the tops of the chord members, from the lower flanges of girders and other points on steel bridges where rust and scale develop more rapidly than elsewhere. Chipping hammers, wire brushes, scrapers and sand blasting are the preferred tools for removing paint from steel surfaces, while the burning torch and putty knife are used to advantage on wood surfaces.

Depends on Condition

By C. Miles Burpee
Research Engineer, Delaware & Hudson, Albany, N.Y.

If the paint in the film was of good quality and is now in good condition, it may not be necessary to remove it. If the film is checked, alligatored, broken, flaking or insecure, and especially if it is brittle and hard, it should be removed completely. A careful inspection of the entire surface should be made, for failure has often occurred only a few months after repainting with good-quality materials, because the old coating was incompatible with that of the new material, particularly after passing a certain age.

If the failure has resulted from building defects, such as poor flashing or free moisture from other conditions, such defects should be remedied prior to cleaning and repainting. Satisfactory removal of old films can be accomplished by burning, but particular care should be exercised around window and door casings and at points where breaks in the surface occur. Frequently only a little flame or a spark is required to start a fire between walls.

A thorough inspection of steel surfaces is also essential. The old film should be in good condition and sufficiently elastic to insure good results after paint has been applied over it. If the primer has deteriorated, dried or lost its elasticity, the entire film should be removed; otherwise, chipping and scaling through to the steel surfaces may occur within a few months after repainting regardless of the elastic properties of the new film. Old brittle films can be removed readily with pneumatic chisels and rotary pneumatic steel brushes. If the latter are used the speed should be slower than for the removal of rust scale.

Historical detail paint records are most important in any painting program. The information they contain will be valuable after a few years, and of considerable assistance in planning painting activities. Continued use of paint materials of proven worth, suited to climatic and service conditions in the particular territory under consideration, is also of prime importance, for good paint materials used and applied properly produce films which retain their elastic and protective properties over long periods. Weathering of such films produces slow checking and wearing away, leaving an ideal surface for repainting, provided repainting has not been postponed for so long that serious deterioration has taken place.

Stopping Surface Slides

What measures can be employed to overcome surface slides that occur on the slopes of cuts or embankments as frost leaves the ground or during rainy seasons? How should the protection be maintained?

Locust or Willow Holds

By L. A. Rape
Section Foreman, Baltimore & Ohio, Taylorstown, Pa.

Any cut having an appreciable area of sloping surface should be protected against erosion by an intercepting ditch on the up-hill side. This will tend to eliminate deep slides in many cases. Often this provision with a seeding of native grasses will stabilize the slopes. I prefer native grasses that are suitable for this purpose because the stand is more likely to be dependable. If stronger and deeper roots are demanded I would use willow or black locust, since these trees can be cut back repeatedly without killing them. Honeysuckle and other vines and shrubs are quite effective in many cases.

Would Use Extra Gang

By R. Rossi
R. Rossi & Son, Chicago

On a district where surface slides are troublesome I would put on an extra gang to cover the entire mileage thus affected. Surface ditches should be constructed or cleaned out where erosion is giving trouble. Slopes should be smoothed and dressed to a plane and where necessary, top soil should be applied, and held in place with bulkheads. If the area of the slope is small, sodding is often most effective and can often be applied at low cost, provided it is available close at hand. If not, the seed of native grasses or, in some cases, special grasses with heavy root systems should be sown liberally. Where heavier root systems are required willows and black locust are excellent since they can be cut back every year if desired.

Vegetation Best

By George S. Fanning
Chief Engineer, Erie, Cleveland, Ohio

This question has to do with the protection of slopes from slides that result from frost or rain, as distinguished from those caused by the presence of ground water. Vegetation is the best protection against such slides. The type of vegetation will vary with climatic conditions. A good growth of grass raised from seed has been used successfully on a number of roads. For example, the Atlantic Coast Line uses Bermuda grass, the stems of which are obtained in cleaning the right of way. The Pennsylvania uses a mixture of seed, consisting by weight of Canadian blue grass, 20 per cent; New Zealand fescue, 10 per cent; red top, 20 per cent; white clover, 10 per cent; perennial rye, 30 per cent; and orchard grass 10 per cent. The Great Northern uses Russian broom grass and white clover, while the western lines of the Canadian Pacific use Brome grass for this purpose.

Vines that produce matty roots have also proved useful. Several eastern lines use honeysuckle. The Pennsylvania also uses Dorothy Perkins roses, bittersweet, snowberry, forsythia and black locust. The Great Northern and the Canadian Pacific use willow cuttings.

If the material comprising the slope will not sustain vegetation, it must be given a dressing of loam and manure or commercial fertilizer. The state highway department of Ohio has

done some successful work on new slopes and what follows is quoted from its specifications.

"All areas to be seeded shall be trimmed neatly and dressed to proper line and grade. If such areas have a composition unsuitable for plant growth, they shall be covered with at least 3 in. of approved top soil. This top-soil covering on slopes shall be held in place by baffle boards at least ½-in. thick, having the same depth as the top-soil covering, anchored by wood or metal pegs driven firmly into the bank at not to exceed 4-ft. intervals. Continuous lines of baffle boards shall be spaced at not to exceed 3-ft. intervals, measured on the slope.

"Upon all areas to be seeded shall be sown broadcast an approved commercial fertilizer at the rate of 10 lb. per 1,000 sq. ft., after which all areas shall be raked thoroughly with a rotary motion to insure a uniform application of fertilizer and depth of cultivation. Upon areas so prepared shall be sown broadcast oats or rye (oats in spring, rye in fall) in the amount of one peck to each 500 sq. ft.; timothy, Kentucky or Canadian blue grass, each in the amount of 1 lb. to each 1,000 sq. ft.; and with an approved mechanical seeder, unscarified sweet clover seed in the amount of 1 lb. to each 450 sq. ft. After seeding, all areas shall again be raked lightly.

"Immediately following the seeding, all areas shall be compacted by rolling or other approved methods and, if specified, healthy, vigorous Vinca Minor (periwinkle or myrtle) plants shall be set out at not more than 2 ft. center to center. They shall be planted so that the roots are at least 3 in. in the ground, and the hole shall be of sufficient size to permit the spreading out of the root growth.

"After planting, all areas shall be top dressed with well-seasoned manure, being left upon completion in a smooth plane, and shall be maintained and sprinkled as often as the weather requires until the completion of the project, or as long as specified."

Who Would Supervise Pumpers?

Who should be responsible for seeing that pumpers carry out instructions with respect to the operation of their plants? For their cleaniness? Why?

Cites A. R. E. A.

By J. H. Davidson
Water Engineer, Missouri-Kansas-Texas, Parsons, Kan.

A model water-service organization has been recommended by the Committee on Water Service, Fire Protection and Sanitation of the American Railway Engineering Association, and has been printed in the Manual of the Association. It is stated by the committee that the object of this department is the economical development, construction, maintenance and operation of water stations for supplying suitable water for locomotives and other railway purposes and to secure efficiency with the minimum change in the existing organization.

In this suggested organization, the duties of the supervisor of water service are described as follows: "The supervisor of water service shall report to the division maintenance office, and shall have charge of gang foremen, repairmen and pumpers. He shall be responsible for the condition, maintenance and operation of pumping machinery, tanks, fire hydrants, pumps, pipe lines and all other facilities for handling water on his territory.

Only the larger systems will find it necessary to have so elaborate an organization as the committee has outlined, but the plan is very flexible and can be altered to meet the needs of any road. Even the smaller roads will find it economical to follow this plan as closely as possible and to have the pumpers directly under the supervision of a foreman who has the ability and training necessary to perform the duties of a supervisor of water service as has been outlined.

The Chief Carpenters

By W. G. Powrie
Engineer of Water Service, Chicago, Milwaukee, St. Paul & Pacific, Chicago

On the Milwaukee, pumpers are responsible to the master carpenter, who corresponds to a bridge and supervisor, for the proper discharge of their duties. Much stress is placed on the need for maintaining the pumping facilities in a clean and orderly condition at all times. It is our thought that good housekeeping encourages better handling of the plants and a higher standard of maintenance. General instructions to pumpers make it clear to them that the responsibility for keeping the plants clean and the equipment in good order rests with them the same as the responsibility for maintaining the water supply. As pumpers have individual opinions on what good maintenance is, policing is needed to insure uniform practices. In this, the chief carpenters are assisted by water inspectors and pump repairers who are in intimate contact with the operation of the facilities.

Every Officer Responsible

By L. G. Byrd
Supervisor of Bridges and Buildings, Missouri Pacific, Poplar Bluff, Mo.

Every supervisory officer whose duties bring him in contact with pumpers is responsible for knowing that instructions are complied with in the operation of the plant and with respect to clealiness, although for purposes of organization the pumper may not be reporting to him. It is our custom to issue instructions to the water-service foreman covering each plant under his jurisdiction. He follows these instructions up with the pumpers, repairmen and helpers to see that they are complied with.

However, since the pumping stations are so widely scattered, it is practically impossible for him or his repairmen to contact each pumper daily or even weekly. For these reasons, the supervisor of bridges and buildings also makes it a point to inspect the condition of the pumping plants whenever he is in the vicinity, and determine from the pumper whether he has the proper understanding of his instructions and whether he is properly familiar with the operation of his plant. He also impresses on the pumper a realization of the importance of clealiness and of continued effort to keep his plant clean. He discusses with him how to handle his treating materials and the proper heat that should be kept on fuel oil. The importance attached to water stations is so great that they should be the object of general co-operation between all employees who have anything to do with them.

Complete instructions are placed in pump houses for the benefit of the pumper and of others who may visit the plant, and supervisors, foremen, inspectors and repairmen should make it their business to know whether they are being carried out. This should not be interpreted to mean that the station and the pumpers' activities are everybody's business and that

everyone should be free to issue such instructions as he may see fit. It only means that obedience to instructions is so important that all of the persons interested should know that they are being obeyed.

Water Service Supervisor

By C. R. Knowles
Superintendent Water Service, Illinois Central, Chicago

Since the supervisor of water service is responsible for all matters pertaining to water supply on his division, it seems logical that the pumpers should report to him and that he should see that they carry out instructions and keep their plants neat and clean. In this connection, it may be well to outline the duties of a pumper. In addition to those involving the operation of the pumps, engines and boilers, he is responsible for the cleanliness of his plant and he is expected to maintain the pumping facilities in good condition so far as ordinary operation is concerned, including such maintenance as is associated with operation. This includes packing pump and valves and making such adjustments to moving parts as may be necessary. When pumping is done by steam, he is also expected to wash the boilers at stated periods. Where treating plants are operated in conjunction with the pumping station, he will be expected to apply the treating chemicals and in some cases make tests of the water to determine the amount of chemicals required.

As a rule, pumpers are expected to make reports to the supervisors of water service at monthly intervals covering the condition of the pumping stations of which they are in charge. They should also keep a daily record of the amount of water pumped, together with a record of fuel, chemicals and supplies, received, used and remaining on hand, and these are forwarded to the supervisor monthly.

Keeping Yards Clear of Scrap

What methods should be employed to keep yards clear of scrap and rubbish during the winter? At other seasons? What provisions should be made for disposing of this material?

Train Foreman

By T. E. MacMannis
Supervisor of Track, Central of New Jersey, Somerville, N.J.

Probably the most important item in any effort to keep scrap and rubbish cleaned up is to train the foremen so that they will gather every day all of the small scrap that may be in the vicinity of the place they are working and place it in a scrap box. If this is done habitually there should be little small scrap scattered through the yard at any time, but if there is, it should first be gathered in as many small piles as may be necessary and then taken promptly to the scrap box. Rails, frogs and other heavy scrap should also be moved to an assigned place and piled neatly, promptly after removal from the track. However, if the force is not large enough to do this, the heavy material should at least be placed clear of the tracks and piled neatly.

During the winter particularly it may be possible to have a crane available to work in the yards. If so, the supervisor has an excellent chance to clean up. The expense will be small, if it can be arranged for the crane to work without a train crew. When a crane can be used, there is a decided saving in both time and money if the scrap boxes are so constructed that the crane can pick them up and dump the contents into a car.

At points where it is unlikely that a crane will be available, the scrap boxes should be located adjacent to a track upon which a car can be spotted for loading by hand. One car can be "tramped" over the entire territory, or until it has been filled. At such places the heavier scrap can be allowed to accumulate until it becomes worth while to arrange a cleaning period with a work train. All roadway and transportation department scrap should be forwarded to the stores department for final disposition.

Again, the winter offers an excellent opportunity to dispose of scrap ties and timbers by burning. The cleaning up of ashes, dirt and other forms of rubbish will depend in large measure on weather conditions. Where there is a considerable volume it is advantageous to have a car spotted, if practicable, for loading the debris before it freezes or is covered by snow. Otherwise, it can best be handled by having everyone who has waste material for disposal, place it in a pile at a point convenient for loading by hand or with a crane. Such accumulations should be cleaned up as early in the spring as possible.

Co-operation Necessary

By Dave Kirkland
Bridge and Building Department, Chicago, Rock Island & Pacific, Fairbury, Neb.

Close co-operation of everyone who has to do with a yard is necessary if it is to be kept clear of scrap and rubbish. If barrels with covers, painted neatly and distinctively, are placed at convenient points throughout the yard for rubbish receptacles, the rubbish problem becomes somewhat simplified. The only problem remaining is to get every one to place his disposable rubbish in the barrels, but by persistent educational methods this can be done. When it is understood that the clean-up campaign is permanent most employees will be delighted to co-operate.

In addition to the rubbish that can be placed in these receptacles for loading, a considerable volume is constantly entering the yard on cars, through the action of trespassers and by numerous other channels. This must be cleaned periodically by the yard section forces. It has been suggested that Saturday afternoons be given over to this work. Much of the rubbish that accumulates around a yard is combustible and can be burned to advantage in incinerators.

Scrap bins should be provided, also at convenient points for storing and sorting scrap for shipment, segregating the scrap from the reclaimable material. Every department should be held responsible for all of the scrap it originates. Where this has been done it is remarkable how the accumulation is reduced. Instructions should be issued and enforced that no job shall be considered complete until all usable material and scrap have been picked up and disposed of. Rigid enforcement of this rule for all departments will stop the practice of allowing scrap to lie around, and will also facilitate the efforts of the stores department to turn it into cash.

This discussion is based on the assumption that each department should be held responsible for keeping its own scrap and rubbish cleaned up. usually this is left entirely to the section forces, and because under this system other departments have no responsibility in the matter, the employees of those departments become utterly indifferent and impose on the section forces in many ways. I am a firm believer in placing responsibility where it belongs.

NEWS of the Month

Organize Group to Support Railroads

For the purpose of "defending the railroads against such legislation as they deem to be unfair, either nationally or in individual states" a group composed of railroad enthusiasts and security holders has been formed in New York and has been designated the "Committee on Railroad Support." The committee, which is restricted in membership, intends to meet monthly for discussion purposes.

Harriman Speaks on Decentralization

All industry would be better understood by the public if the policies were not dictated from New York entirely and if the higher officers had their offices in smaller centers throughout the country, said W. A. Harriman, chairman of the board of the Union Pacific, in a recent address at New York. Speaking of the railroads, Mr. Harriman pointed out that the carriers have initiated a national public relations campaign, and "as a result they have corrected some of their deficiencies, and today, although their financial situation is bad, there is a better feeling. Going back over 30-odd years there has never been a time when there has been a better feeling towards the railroads." The speaker added that "I can say that I and many railroad men feel that the president of the United States is perhaps the best friend of the railroads that we have."

Would Permit Rails to Operate Ship Lines

The suggestion that railroads be permitted to take a hand in rehabilitating the American Merchant Marine was advanced by Joseph P. Kennedy, ambassador to England and retiring chairman of the Maritime Commission, in recent testimony at a joint hearing before the Senate committees on commerce and on education and labor. Mr. Kennedy's suggestion concerning the railroads came during consideration of possible sources of private funds for the construction of ships. Some of the railroads, he said, "have considerable money and perhaps that will be a way out; perhaps the theoretical harm therefrom might be eliminated so as to have some of these ships built and operated by the railroad companies." Hence, he said, "there may be some suggestion made to Congress that the provisions of the Interstate Commerce Act—which does not now allow any railroad to run a ship line in the same business—might be repealed."

Streamliners on the Santa Fe

On February 22 the Atchison, Topeka & Santa Fe placed in service three additional light-weight streamlined trains, and in the immediate future it plans to place nine more such trains in service. Thus, including the Super Chief, the original streamlined train on the Santa Fe, this company will soon have 13 trains of this type in operation. The trains that were inaugurated on February 22 include an additional Super Chief, with 12 cars, which operates between Chicago and Los Angeles; and two 5-car coach trains, known as the El Capitans, which serve the same points. In addition, the present Chief, operating on a daily schedule between Chicago and Los Angeles, will be re-equipped with six complete trains of 12 cars each; two 7-car trains, known as the Kansas Cityan and the Chicagoan, will be placed in service between Kansas City and Chicago on April 1; and a 5-car train, known as the San Diegan, will go into service between San Diego, Cal., and Los Angeles on March 15.

"Pendulum" Cars Tested on Santa Fe

A new type of railway passenger car, in which the car is "suspended" from the trucks, has been built and is now being subjected to test service on the Atchison, Topeka & Santa Fe near Los Angeles, Cal. The experiments are being carried out with a two-car articulated unit, the construction and design of which was sponsored by C. T. Hill, son of Louis W. Hill, retired chairman of the Great Northern. In the new design the car body floats on soft vertical coil springs, one on each side of the truck, which receive their load at a level that is above the center of gravity of the car. Hence the car body is virtually suspended from the truck so that any tendency for body roll on curves is in such a direction as to correct for uncompensated side force. This action is in direct contrast to the behavior of a standard car which has a tendency to lean outwardly on curves that are insufficiently elevated.

The experimental cars embodying the new type of truck design are of light-weight construction and embody a type of body design that involves a marked departure from standard practice. As a result of tests made to date it is reported that standing and walking about in the cars while they are in motion is accomplished with greater ease and with a feeling of greater stability than in a standard car weighing six times as much as the new unit.

Pensions Paid to 72,613 Ex-Railroaders

Approximately $4,500,000 was being paid in pensions and annuities to 72,613 former railroad workers in November, 1937, under the Railroad Retirement Act, according to the annual report of the Railroad Retirement Board, which was made public on February 7. Of the monthly payments in force on November 30, 1937, 26,090 were annuities granted under the 1935 and 1937 acts, and 46,523 were pensions paid to former railroad men who had been retired with pensions by their former employers and who had been transferred to the Railroad Retirement Board rolls under the terms of the 1937 act. The report stated the average monthly payments to annuitants as of October 31, 1937, was $70.30 a month, excluding certain partial awards.

Rate Case Now in Hands of I.C.C.

By February 9, hearings, rebuttal testimony and briefs pertaining to the railroads' plea for a 15 per cent increase in freight rates had been completed or submitted and the case was entirely in the hands of the Interstate Commerce Commission. The concluding feature of the hearing was the railroads' rebuttal argument, which was presented by Judge R. V. Fletcher, vice-president and general counsel of the Association of American Railroads. Judge Fletcher, who talked for nearly two hours, presented the railroad case as a revenue proceeding and contended that in such a case the burden of proof is met by a showing of the imperative need for revenue. The latter, he insisted, had been shown by evidence indicating that if 1938 traffic is about the same as that of 1936 the carriers, without any increase in rates, would earn this year a net railway operating income of about $365,000,000 and report a deficit after charges of about $137,000,000. This being the case, he added, 1938 would be the

worst year in recent railroad history, if not the worst in all history. The situation "would be desperate indeed."

Rail Parley to Be Held at White House

Problems of the railroad industry, including consideration of methods to place the railroads on a sounder financial basis, are to be considered at a conference which President Roosevelt expects soon to hold at the White House. Those who have been invited to attend the conference include Walter M. W. Splawn, chairman of the Interstate Commerce Commission; Joseph B. Eastman, a member of the commission and formerly federal co-ordinator of transportation; Senator Burton K. Wheeler, chairman of the Interstate Commerce committee of the Senate; Representative Clarence Lea, chairman of the House Interstate and Foreign Commerce committee; Jesse Jones, chairman of the Reconstruction Finance Corporation; Carl R. Gray, vice-chairman of the Union Pacific; and George M. Harrison, head of the Railway Labor Executives' Assn.

Appointment of New A.R.E.A. Secretary Causes Changes in Editorial Staff

Walter S. Lacher, managing editor of *Railway Engineering and Maintenance* and engineering editor of the Railway Age, has resigned, effective March 18, to become secretary of the American Railway Engineering Association and of the Engineering division of the Association of American Railroads, with headquarters at Chicago, to fill the vacancy created by the resignation of E. H. Fritch last year. Neal D. Howard, eastern editor of *Railway Engineering and Maintenance* and eastern engineering editor of the Railway Age, with headquarters at New York, has been promoted to the position made vacant by the resignation of Mr. Lacher, with headquarters at Chicago. Merwin H. Dick, associate editor of *Railway Engineering and Maintenance* and of the Railway Age at Chicago, has been promoted to succeed Mr. Howard at New York.

Mr. Lacher was born at Winona, Minn., on April 7, 1884, and was graduated from the University of Wisconsin in 1907. He first entered railway service in July, 1905,

Walter S. Lacher

as a rodman on the Chicago & Alton (now the Alton), and served subsequently as an instrumentman and field draftsman on construction. From July, 1907, to July, 1908, he served as assistant engineer in maintenance and construction on the same road and from the latter date until January 1909, he was connected with the Illinois Highway Commission as a designer of bridges. At the end of this period Mr. Lacher entered the service of the Chicago, Milwaukee & St. Paul (now the C. M. St. P. & P.), as an engineer draftsman in the bridge department, subsequently becoming office engineer in bridge design. In May, 1915, he joined the staff of the Railway Age as assistant engineering editor, becoming western engineering editor a year later. In June, 1916, he was appointed also associate editor of the Railway Maintenance Engineer (now *Railway Engineering and Maintenance*), and in 1917 he was promoted to managing editor. In 1931 Mr. Lacher was appointed also engineering editor of the Railway Age. Mr. Lacher has been active in the affairs of various railroad associations, including the A.R.E.A., in which he has served on various committees since he became a member in 1913. He is now a member of the Executive Committee of the Roadmasters and Maintenance of Way Association and second vice-president of the American Railway Bridge and Building Association. He has been secretary-treasurer of the Maintenance of Way Club of Chicago since its formation in September, 1921.

Neal D. Howard

Mr. Howard was born at Rochester, N. Y., on December 23, 1898, and received his higher education at Rensselaer Polytechnic Institute, from which he was graduated in 1922 with the degree of C. E. Immediately following graduation he entered the service of the Illinois Central on its St. Louis division, as a chainman, with headquarters at Carbondale, Ill., and on June 4, 1923, he was promoted to rodman, with the same headquarters. During his service on the Illinois Central, which extended until August 15, 1924, Mr. Howard was engaged in both construction and maintenance of way work, and made many performance studies of gang organizations and of units of work equipment. On the latter date, he left the road to become associate editor of the 1926 edition of the Railway Engineering and Maintenance Cyclopedia, published by the Simmons-Boardman Publishing Corporation, with headquarters at Chicago, and in August, 1926, he was appointed eastern engineer-

Merwin H. Dick

ing editor of the Railway Age and eastern editor of *Railway Engineering and Maintenance*, at New York, where he was located until his recent appointment. Mr. Howard is a member of the American Railway Engineering Association, the Roadmasters' and Maintenance of Way Association, the American Railway Bridge and Building Association, the Metropolitan Track Supervisors' Club of New York, and the International Railway Maintenance Club.

Mr. Dick was born on August 19, 1906, at Newton, Kan., and was educated at the University of Kansas, graduating in 1928 with a Bachelor of Science degree in civil engineering. He first entered railway service in 1924 as a chainman on the staff of the division engineer of the Atchison, Topeka & Santa Fe at Newton and during ensuing summer vacations he served as a chainman and rodman at this point, at Arkansas City, Kan., and at Chanute, Kan. After graduation he returned to this company as a rodman, which position he held until October, 1929, when he resigned to go with the Simmons-Boardman Publishing Corporation as associate editor of the Railway Age and of *Railway Engineering and Maintenance* with headquarters at Chicago.

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101 Uses for Wrought Iron.—The A. M. Byers Company, Pittsburgh, Pa., has issued a booklet of 32 pages (letter size) comprising an album of photographs, illustrating the varied uses of genuine wrought iron. Except for a brief introduction, the text matter is confined to captions for the illustrations, no small part of which cover railroad applications, such as pipes for many purposes, blast plates, cover plates, smoke stacks, track pans, pier protection plates, coaling stations and tell-tail poles.

Association News

Bridge and Building Association

Members of the association who are visiting the convention of the American Railway Engineering Association and the exhibit of the National Railway Appliances Association will gather for lunch in the Ivory room at Mandel Brothers department store, Chicago, at 12:30 on Tuesday noon, March 15. Arrangements are also being made for a table for members of the Bridge and Building Association at the A.R.E.A. luncheon at the Palmer House on Wednesday, March 16.

Maintenance of Way Club of Chicago

The Work of the Special Agent was the subject of an address by T. T. Keliher, chief special agent of the Illinois Central, which was presented before the club at the meeting on February 28. Motion pictures were shown also on the Flash Butt-Welding of Rails, with explanations by C. W. Gennett, Jr., vice-president of Sperry Rail Service.

The next meeting will be held on March 28, when four speakers will discuss the design, manufacture, installation and maintenance of frogs and crossings.

Metropolitan Track Supervisors' Club

In the interest of promoting the increased use of anthracite coal, a concern of so many of its member roads, the club turned over its meeting on February 24 to Anthracite Industries, Inc., a non-profit corporation organized and supported by the leading coal producers of Pennsylvania, to encourage improvements in and wider distribution of modern anthracite-burning equipment. The meeting, which was well attended, was held at the Hotel McAlpin, as usual, and was preceded by dinner served at 6:30 p.m.

Roadmasters' Association

Arrangements are being made for a table for members of the Roadmasters' Association at the luncheon of the A.R.E.A. at the Palmer House, Chicago, on Wednesday noon, March 16. It is also contemplated that officers and members of the Executive Committee who are attending the A.R.E.A. convention will hold an informal meeting during that convention at a place and hour, the details of which will be available at the desk of **Railway Engineering and Maintenance** immediately outside the door of the A.R.E.A. convention room on the fourth floor of the Palmer House.

Spray Painting Equipment—The DeVilbiss Company, Toledo, Ohio, has published a new general catalog covering its complete line of spray painting equipment for interior and exterior painting. This catalog, known as DF, contains 48 pages and is illustrated.

Personal Mention

General

John Hewes, Jr., formerly a division engineer on the Baltimore-Ohio who has been promoted to superintendent with headquarters at Newark, Ohio, as reported in the January issue, is a native of Baltimore, Md., and was born on December 9, 1887. Following the completion of his education in the public schools he entered service with the B. & O. as an axeman in the engineering department in 1905, and during the following six years he held the positions of chainman, rodman, levelman and transitman. In 1914 Mr. Hewes was appointed bridge inspector, with headquarters at Cincinnati, Ohio, and in the following year he was advanced to assistant superintendent of the Ohio division, with headquarters at Hamden, Ohio. In 1916, he was assigned to the chief engineer's office as a draftsman, becoming a field engineer in 1917, assistant engineer in 1918 and division engineer at Flora, Ill., later in the latter year. In 1925, Mr. Hewes was made assistant superintendent at Akron, Ohio, and four years later he was sent to Pittsburgh as transportation assistant, which position he was holding at the time of his recent appointment.

Luis G. Morphy, general superintendent and chief engineer of the Rutland, who has been appointed general manager and chief engineer, with headquarters as before at Rutland, Vt., as reported in the January issue, was born at Orizaba, Vera Cruz, Mexico, on December 4, 1876, and attended Spring Hill College, Mobile, Ala., receiving his bachelor of science degree in 1897. He also attended Rensselaer Polytechnic Institute, Troy, N. Y. He entered railway service in 1900 as a transitman with the New York Central, serving successively as supervisor of track, assistant engineer, resident engineer and assistant to principal assistant engineer. In 1907, Mr. Morphy became assistant engineer maintenance of way and construction of the Boston & Albany, then serving as assistant to chief engineer, designing and division engineer and principal assistant engineer, consecutively. In 1920, he became manager in South America of the Foundation Company of New York. From 1921 to 1926, he served as chief engineer of the Rutland, becoming general superintendent and chief engineer in 1926.

Luis G. Morphy

Engineering

J. E. Vandling, division engineer of the Buffalo division of the Pennsylvania, with headquarters at Buffalo, N.Y., has been transferred to the Eastern division, with headquarters at Pittsburgh, Pa., succeeding **J. A. Schwab,** whose appointment as superintendent of the Logansport division was reported in the February issue.

T. P. Warren, roadmaster on the Chicago, Rock Island & Pacific, with headquarters at Atlantic, Iowa, has been promoted to division engineer of the Chicago division, with headquarters at Chicago, to succeed **H. G. Dennis,** who has been transferred to the Southern division, with headquarters at Ft. Worth, Tex., succeeding **Bert Matheis,** who has been assigned to other duties.

J. E. Fanning, assistant engineer on the Illinois Central, with headquarters at Waterloo, Iowa, has been promoted to division engineer, with the same headquarters, to succeed **H. Rhoads,** whose death on February 6 is reported elsewhere in these columns. **N. R. Hill,** supervisor of track at Council Bluffs, Iowa, has been appointed assistant engineer at Waterloo, to succeed Mr. Fanning.

Frank L. Guy, whose promotion to engineer maintenance of way and structures of the Pacific lines of the Southern Pacific was reported in the February issue, was born in Gallipolis, Ohio, on March 16, 1883. He received his education in the public and high schools of Topeka, Kan., and at the University of Kansas, and entered railway service in August, 1901, with the Atchison, Topeka & Santa Fe as a chaiman. During the years that followed he served various western railroads, advancing from the position of axeman to rodman, transitman, assistant engineer and locating engineer. In July, 1914, he was made division engineer of the El Paso & Southwestern (now part of the Southern Pacific), and in November, 1924, he became division engineer for the Southern Pacific. Mr. Guy will continue to make his headquarters at San Francisco, Cal.

Leon V. Lienhard, roadmaster on the Colorado division of the Atchison, Topeka & Santa Fe, with headquarters at Pueblo, Colo., has been promoted to division engineer of the Oklahoma division with headquarters at Arkansas City, Kan., succeeding **Fred H. Frailey,** whose death was reported in the January issue.

Mr. Lienhard was born at Cuero, Tex., on September 26, 1891, and was graduated in civil engineering from Texas A. & M. College in 1913. He began service with the Santa Fe on August 1 of that year as a draftsman in the chief engineer's office at Amarillo, Tex. He advanced through the positions of rodman and transitman and became office engineer for the district

engineer at Amarillo in February, 1917. He was made chief draftsman in the chief engineer's office in September, 1919, and held this position until appointed roadmaster at Pueblo, Colo., in October, 1926. He was advanced to division engineer in June, 1929, being stationed at Slaton, Tex., but was sent to San Angelo, Tex., as assistant division engineer in September, 1930. He returned to Pueblo as roadmaster in September, 1931, and held that position until his recent promotion.

James V. Johnston, whose appointment as principal assistant engineer of the Mobile & Ohio, with headquarters at St. Louis, Mo., was reported in the January issue, as born on September 4, 1890, at Coldwater, Miss. After attending Mississippi Agricultural and Mechanical College (now Mississippi State College), Mr. Johnston entered railway service on February 1, 1912, as an instrumentman on a predecessor line of the Gulf, Mobile & Northern. On May 1, 1913, he left this company to become city engineer of Laurel, Miss., returning to railway service on September 1, 1914, as land engineer on a valuation survey of the Mobile & Ohio. During the war he served with the United States Army from May 15, 1917, to July, 1919, as a first lieutenant and later as captain, corps of engineers. Following the war, he returned to the service

James V. Johnston

of the M. & O. as a draftsman, holding this position until March 1, 1920, when he was appointed assistant to the bridge engineer of the same company. On October 1, 1920, he was promoted to division engineer, holding this position until his recent appointment.

Anton Anderson, engineer maintenance of way of the Chicago, Indianapolis & Louisville, with headquarters at Lafayette, Ind., has been promoted to chief engineer, effective February 1, with the same headquarters, and the position of engineer maintenance of way has been abolished. Mr. Anderson succeeds **A. S. Kent,** chief engineer, with headquarters at Chicago, who has retired. **E. M. Graham,** principal assistant engineer, will soon move his headquarters from Chicago to Lafayette.

Mr. Anderson was born at Lafayette, Ind., on October 12, 1879, and attended Purdue university. After working a year in a structural steel shop at St. Louis, Mo., Mr. Anderson entered railway service in 1902, as a draftsman for the Choctaw, Oklahoma & Gulf (now part of the Chicago, Rock Island & Pacific). In the following year he became office engineer and masonry engineer for the Indianapolis Northern Traction Company, and in January, 1903, he became engaged on location work for the Midland Valley. In August, 1904, he was appointed city engineer at

Anton Anderson

Lafayette, later resigning this position to become resident engineer at the same place for the Chicago, Indianapolis & Louisville. On this road he advanced successively through the positions of engineer of construction, assistant engineer, division engineer, and principal assistant engineer. In August, 1918, he was made corporate engineer and in March, 1920, he was promoted to engineer of maintenance of way which position he held until his recent promotion to chief engineer.

M. H. Brown has been appointed superintendent maintenance of way and structures of the Butte, Anaconda & Pacific, with headquarters at Anaconda, Mont., to succeed **T. J. McCarvel,** who has retired after 38 years of service with this company. Mr. Brown goes to the B.A. & P. from the Union Pacific, where he has been connected with the engineering department for many years.

J. M. Fox, division engineer of the Chicago terminal division of the Pennsylvania, with headquarters at Chicago, has been transferred to the New York division, with headquarters at Jersey City, N.J., succeeding **R. H. Crew,** who has been appointed acting engineer maintenance of way of the Eastern Pennsylvania division at Harrisburg, Pa. **L. E. Gingerich,** division engineer of the St. Louis branch, with headquarters at Terre Haute, Ind., has been transferred to the Chicago Terminal division, to succeed Mr. Fox. **J. L. Cranwell,** assistant division engineer of the Fort Wayne division, has been promoted to division engineer of the St. Louis branch, succeeding Mr. Gingerich.

Mr. Cranwell was born at Shreveport, La., on October 31, 1905. He graduated from the University of South Carolina in 1926, and on July 13 of the same year he entered the service of the Pennsylvania as a rodman on the Norfolk division. In January, 1927, he was transferred to Washington, D. C., and in April of the same year he was sent to Baltimore, Md., as an assistant on the engineer corp, being appointed assistant supervisor of track at Hollidaysburg, Pa., in May, 1927. On January 1, 1930, he was made supervisor of track of the Trenton division at Bordentown, N. J., but was transferred to the New York division as assistant supervisor in December of that year. After being moved to Downington, Pa., in June, 1932, as assistant supervisor of the Philadelphia division, he was again advanced to supervisor of track at Williamsport, Pa., in December of the same year, subsequently serving in a similar capacity at East Liberty, Pa., and Johnstown, Pa., on the Pittsburgh division. In February, 1936, he was promoted to assistant division engineer and assigned to special duties in the office of the vice-president in charge of operation at Philadelphia, Pa. He was appointed assistant division engineer with headquarters at Fort Wayne, Ind., on July 1, 1937.

Track

N. W. Baxter has been appointed roadmaster on the Chicago, Rock Island & Pacific, with headquarters at Peoria, Ill., to succeed **W. E. Haberlaw,** who has been transferred to Des Moines, Iowa. Mr. Haberlaw succeeds **V. W. Reed,** who has been transferred to Atlantic, Iowa, to replace **T. P. Warren,** whose appointment as division engineer is noted elsewhere in these columns.

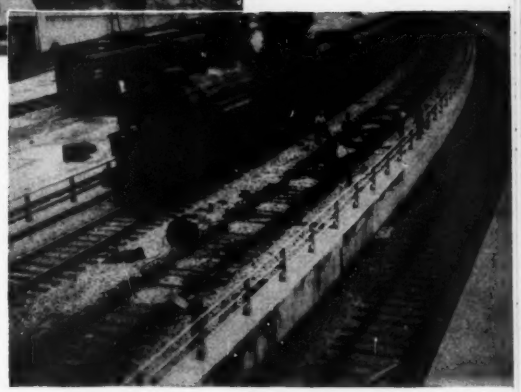
E. R. Word, assistant engineer in the office of the chief engineer of the Illinois Central at Chicago, has been appointed supervisor of track, with headquarters at Council Bluffs, Iowa, to succeed **N. R. Hill,** whose promotion to assistant engineer is noted elsewhere in these columns. **B. P. Brevard,** an instrumentman on the Memphis division, has been promoted to supervisor of track at Rolling Fork, Miss., to succeed **F. R. Bishop,** who has retired.

L. W. Jones, a track supervisor on the Chicago, Burlington & Quincy, has been promoted to roadmaster, with headquarters at Curtis, Neb., to replace **Leslie Cross,** who has been transferred to Ferry, Neb. Mr. Cross relieves **W. F. Jarl,** who has been transferred to Oxford, Neb., where he replaces **P. Traut,** roadmaster at Red Cloud, Neb., who has retired after 46 years service with the Burlington.

R. C. Matthews, assistant engineer in the office of the chief engineer of the Western lines of the Atchison, Topeka & Santa Fe at Amarillo, Tex., has been promoted to roadmaster on the Colorado division, with headquarters at Syracuse, Kan., succeeding **Phillip Immroth,** who has been transferred to Pueblo, Colo., on the same division, where he succeeds **L. V. Lienhard,** whose promotion to division engineer of the Oklahoma division, with headquarters at Arkansas City, Kan., is reported elsewhere in these columns.

Mr. Matthews was born in Mulhall, Okla., on February 10, 1899. After graduating from Oklahoma A. & M. College in

The PIONEER RAIL WELDING PROCESS



Wasp-waisted women wore bustles and leg-o-mutton sleeves . . . peg-top trousers were the style for men . . . scenic china picturing Dewey at Manila graced the nation's plate racks, when the first Thermit Welded track was installed.

To Thermit Engineers, the welding of rails is an old story . . . one with which they have become thoroughly familiar through nearly four decades of continuous research and practical application. There are few problems in rail welding, on railroads or street railways, with which they have not had first-hand experience.

With authorities agreeing that nearly fifty per cent of present track maintenance can be saved by eliminating rail joints, you will want full data on the Thermit Weld. You will be interested in learning how small the equipment is; how your own track forces can be quickly trained to do the work. You will want to know, also, why the Thermit process provides the ideal type of rail weld. Write, today, for complete information.

THERMIT Rail WELDING

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1922, he immediately entered the service of the Santa Fe as a chainman. During the years that followed he worked out of Wellington, Kan., as a transitman and assistant roadmaster until 1937, when he was appointed assistant engineer at Amarillo, in which capacity he had charge of grade separation work at Albuquerque, N. M., and of construction and location work on the New Mexico division.

George E. Baines, who has been promoted to roadmaster on the Canadian Pacific at Manyberries, Alta., as reported in the February issue, was born in England on February 21, 1895. He began railway service with the Canadian Pacific as a section laborer in June, 1910. In October, 1912, he was promoted to section foreman at Cowley, Alta., and was made extra gang foreman on November 1, 1914. He was appointed section foreman at Blairmore, Alta., in August, 1930, serving in addition as snow plow foreman for the Crowsnest subdivision, and held this position at the time of his promotion.

J. S. Dant, Jr., who has been appointed track supervisor on the Wabash, at Albia, Iowa, as reported in the February issue, was born at Kansas City, Mo., on June 28, 1908. He graduated from the University of Michigan in 1931 and immediately entered the service of the Wabash as a rodman at St. Charles, Mo. He was soon transferred to Toledo, Ohio, and later served at Detroit, Mich., as a section laborer at various times. In 1933, he was made bridge inspector, in which capacity he served at Decatur, Ill., and Raymond until September, 1934, when he became a track man at Decatur. In March, 1935, he again became a bridge inspector, holding this position until July, 1935, when he was advanced to third assistant engineer at Moberly, Mo. In February, 1937, he was promoted to second assistant engineer at Montpelier, Ohio, where he was located until his recent promotion.

Arthur Price, general foreman on the Erie, with headquarters at Jersey City, N.J., has been promoted to supervisor of track, with headquarters at Butler, N. J., to succeed **J. H. Duane,** who has been transferred to Warsaw, N.Y., to take the place of **L. E. Rodgers,** who has been transferred to Callicoon, N.Y. Mr. Rodgers succeeds **J. W. Moynihan,** who has been moved to Elmira, N.Y., as supervisor of track, to take the place of **R. E. Ruby,** who has been acting supervisor at that point during the leave of absence of **J. R. Whalen,** whose death on January 25 is noted elsewhere in these columns. Mr. Ruby has been appointed supervisor at North Hackensack, N.J., where he succeeds **T. J. Leonard,** who has been transferred to Buffalo, N.Y., to take the place of **W. E. Stenson,** retired.

Mr. Price began his career on the Erie in June, 1916, as a machine apprentice at Dunmore, Pa., where he remained until July, 1918, when he resigned. In April, 1925, he returned to the Erie as a rodman at Dunmore. In May, 1927, he was appointed levelman at the same point, and on June 1, 1928, he was made engineer accountant, with headquarters at Jersey City, N.J. Later he was appointed head engineer accountant, retaining that title until April, 1931, when he was made senior transitman, with headquarters at the same point. He then served as chief of corps on the Wyoming, Jefferson and Wilkes-Barre and Eastern divisions, with headquarters at Dunmore, until March, 1934, when he was transferred as chief of corps to Hornell, N.Y. On February 1, 1936, Mr. Price was appointed general foreman at Susquehanna, Pa., and the following December, was transferred to Jersey City, N.J., where he was located at the time of his recent promotion to supervisor at Butler.

Mr. Stenson was born on February 28, 1874, and started his railway career with the Erie on March 1, 1909, as a section foreman on the Rochester division. One month later, Mr. Stenson was promoted to supervisor of track on the same division and remained there until December 12, 1918. He was then transferred to the Susquehanna division, where he remained until December 1, 1929, when he was again transferred to the Buffalo division, where he was located at the time of his recent retirement.

Bridge and Building

J. R. Altizer, assistant supervisor of bridges and buildings on the Radford division of the Norfolk & Western, has been promoted to supervisor of bridges and buildings of the same division, with headquarters at Roanoke, Va., to succeed **R. E. Dailey,** who retired on February 1.

D. C. D. Todd, assistant master carpenter on the Philadelphia (Pa.) Terminal division, has been promoted to master carpenter of the Fort Wayne division, with headquarters at Fort Wayne, Ind., where he succeeds **D. E. Saurer,** who has been transferred to the Logansport division to succeed Mr. Potts.

H. F. Potts, acting master carpenter on the Logansport division of the Western region of the Pennsylvania, with headquarters at Logansport, Ind., has been appointed master carpenter of the Grand Rapids division, with headquarters at Grand Rapids, Mich., succeeding **H. M. Large,** who retired on February 1.

R. D. Ransom, supervisor of bridges and buildings on the Madison division of the Chicago & North Western, with headquarters at Madison, Wis., has had his jurisdiction extended over that portion of the same division which was formerly under the supervision of **J. W. McCarl,** supervisor of bridges and buildings at Winona, Minn., whose death is noted in these columns. **C. G. Friets,** a bridge and building foreman, has been appointed to the newly-created position of assistant supervisor of bridges and buildings, with headquarters at Winona.

Bird J. Howay, water service supervisor on the Pere Marquette at Edmore, Mich., who has been appointed supervisor of bridges and buildings and water service on the Detroit-Grand Rapids division, with headquarters at Grand Ledge, Mich., as reported in the February issue, was born on June 11, 1885, at Vestaburg, Mich. He entered the service of the Pere Marquette on April 8, 1908, as carpenter foreman on the Grand Rapids division at Edmore. In December, 1912, he was transforred to the Toledo-Ludington division, and was transferred again in December, 1913, to the Port Huron-Grand Rapids division. He remained in this position until May, 1926, when he was promoted to supervisor of water service, holding this position until his recent advancement on February 1.

D. E. Wiltse, who has been promoted to master carpenter of the Columbus division of the Pennsylvania, with headquarters at Columbus, Ohio, as reported in the February issue, graduated as a civil engineer from New York University in 1911. Since 1915 he has been continuously with the Pennsylvania, serving in different capacities in the engineering and maintenance of way department. At different times he has served as special bridge inspector for the engineer maintenance of way, assistant master carpenter, and master carpenter at various points. He also served as engineer in charge and assistant engineer on the Philadelphia (Pa.) terminal improvements. At the time of his recent appointment, Mr. Wiltse was assistant master carpenter of the Baltimore and Maryland division.

T. H. Thompson, supervisor of scales of the Chicago, St. Paul, Minneapolis & Omaha, has been appointed supervisor of bridges and buildings, with headquarters as before at St. Paul, Minn. He succeeds **A. G. Rask,** who retired on February 1 after 50 years service to this company. **M. W. Marden,** bridge and building foreman, with headquarters at St. Paul, has been promoted to supervisor of scales, succeeding Mr. Thompson.

Mr. Thompson was born on November 11, 1886, and began his career with the C.St.P.M.& O. as a bridge carpenter on July 11, 1907. From 1912 to 1917, he worked intermittently as bridge foreman and pile-driver engineer until he was appointed scale inspector for the entire system in 1917. He was made supervisor of bridges and buildings in March, 1923, with headquarters at Worthington, Minn., and held this position until January 31, 1932, returning soon thereafter to the position of scale supervisor. He continued to hold this position until his recent appointment.

Mr. Marden, who succeeds Mr. Thompson as supervisor of scales, was born at Worthington, Minn., on May 10, 1893, and graduated from the high school there. He entered the service of the C.St.P.M. & O. on June 10, 1909, and has spent his entire career in the engineering department of that road.

Obituary

H. Rhoads, division engineer on the Illinois Central, with headquarters at Waterloo, Iowa, died suddenly on February 6 at Dubuque, Iowa.

Walter G. McDonald, supervisor of bridges and buildings for the Lines West of the Chicago, Burlington & Quincy, with headquarters at Lincoln, Neb., died

in Denver, Colo., on February 1 following a cerebral hemorrhage. He had been with the Burlington for 40 years.

J. W. McCarl, supervisor of bridges and buildings on the Madison division of the Chicago & North Western, with headquarters at Winona, Minn., died on January 31.

Wallace McCready, assistant engineer in charge of turntable work on the Chicago, Burlington & Quincy, with headquarters at Chicago, died on February 21 as a result of a stroke.

J. H. Wallace, formerly engineer maintenance of way of the Pacific system of the Southern Pacific, died at Los Angeles, Cal., on February 1. Mr. Wallace, at the time of his death, was 81 years of age; he had been retired since 1908. He was born in California on August 3, 1856, and entered railway service in 1880, with the San Joaquin & Sierra Nevada, now part of the Southern Pacific. He advanced through the positions of assistant engineer, roadmaster, assistant superintendent of track, to that of engineer maintenance of way in which capacity he was located at San Francisco, Cal. In July, 1906, he was appointed to the position of assistant chief engineer, but he resigned this position in July, 1908.

James R. Whalen, supervisor of track on the Erie, with headquarters at Elmira, N.Y., died at Elmira on January 25. Mr. Whalen was born on March 16, 1879, and started his railway career in September, 1917, as a trackman on the Allegheny division of the Erie. He served in this capacity until April, 1918, when he was appointed section foreman on the same division, holding this position until January, 1927, when he was appointed supervisor of track on the Dunkirk branch. The following September, Mr. Whalen was transferred to Salamanca, N.Y., where he remained until March, 1928, when he was appointed general foreman of Hornell yard at Hornell, N.Y. A few months later he was promoted to supervisor of track at Elmira, where he served until December, 1937, at which time he was granted a leave of absence because of ill health.

Julius H. Goos, formerly inspecting engineer of track for the Great Northern, died suddenly at his home in St. Paul, Minn., on February 1 as a result of a stroke. Mr. Goos was born at Kappeln, Germany, on October 22, 1882, and came to this country as a young boy with his parents, who settled in Gladbrook, Iowa. Following his graduation from the Gladbrook high school he attended Iowa State College. He worked for a short time for his father and for other concerns after leaving school, and entered the service of the Great Northern on April 1, 1903, as a topographer in a survey party running lines to Thief River Falls, Minn. In June, 1904, he became a draftsman in the office of the district engineer at Superior, Wis., and advanced successively through the positions of assistant engineer and rail inspector to become inspecting engineer of track on January 1, 1912. This position he held until his retirement because of ill health, which became effective on March 31, 1934.

Supply Trade News

Personal

The Flexrock Company, Philadelphia, Pa., has established a branch office at Atlanta, Ga., and has placed **J. F. Prince** in charge, with the title of southern sales manager.

F. B. Horstmann has been appointed technical director, railroad department, of the **Dearborn Chemical Company,** Chicago, with duties to include the general supervision of all railroad department matters falling under that head.

Standard Equipments, exclusive sales agents for the Evertite rail joint, has consolidated its New York office with its Chicago office, located at 310 So. Michigan avenue. **C. O. Bradshaw,** president, formerly at New York, is now located at the Chicago office.

Charles R. Moffatt, advertising manager of the **Carnegie-Illinois Steel Corporation** and director of exhibits of the **United States Steel Corporation,** has been appointed director of advertising for the **United States Steel Corporation of Delaware,** with headquarters at Pittsburgh, Pa., where the advertising and exhibit activities have been combined. **G. Reed Schreiner,** assistant advertising manager of the **Carnegie-Illinois Steel Corporation,** has been appointed advertising manager to succeed Mr. Moffatt.

Mr. Moffatt was born in LeSueur, Minn., on May 15, 1887, and entered the employ of the United States Steel Corporation in 1907, in the invoice department of the Illinois Steel Company in Chicago. A year later he was transferred to the voucher departemnt and four years later, in 1912, was appointed traveling

Charles R. Moffatt

auditor. In 1919 he was transferred to the sales department as manager of the statistical department and advertising manager. He held these positions until the Illinois Steel Company was consolidated with the Carnegie Steel Company in 1935, when, on October 1, 1935, he was appointed advertising manager of the Carnegie-Illinois Steel Corporation, with headquarters at Pittsburgh. On July 1, 1935, he was appointed director of exhibits of the United States Steel Corporation.

Mr. Schreiner was born at Pittsburgh, Pa., on June 16, 1895, and received his A.B. degree at the University of Pittsburgh in 1916. After serving in the United States Army during the World War, he entered the advertising department of the Carnegie Steel Company in January, 1919, and has served continuously with that department. He became assistant advertising manager in October, 1935, when the Carnegie-Illinois Steel Corporation was organized.

Frederick T. Robertson has been appointed vice-president of the **Lewis Bolt & Nut Co.,** Minneapolis, Minn. After obtaining his engineering degree, Mr. Robertson was employed by the Canadian

Frederick T. Robertson

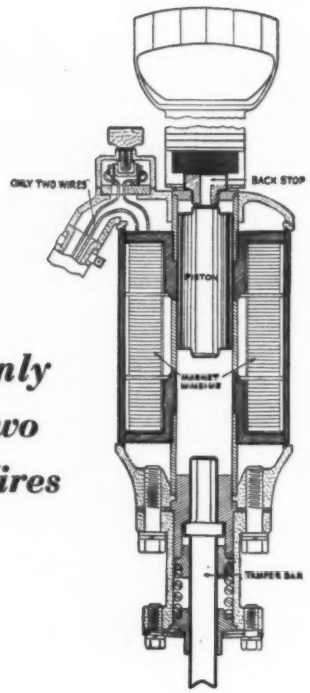
Pacific and the Chicago, Burlington & Quincy. Later he worked for Consoer, Older & Quinlan, consulting engineers, Chicago, and for the last six years has been with the Lewis Bolt & Nut Co.

D. J. Crowley, formerly special representative of **Hubbard & Company,** Pittsburgh, Pa., with headquarters at Chicago, has organized the **Universal Spring Washer & Supply Company,** 6 North Michigan avenue, Chicago, to manufacture and sell the Universal spring washer, heretofore sold by Hubbard & Company.

J. R. Fraine has been appointed assistant manager of sales of the **Republic Steel Corporation,** wire division for the northern territory, with headquarters at Chicago. **Carl C. Brown,** district sales manager at Birmingham, Ala., has been appointed assistant manager of sales of the wire division, at the same point.

Barco Unit Tytampers—A six-page illustrated folder recently issued by the Barco Manufacturing Company, Chicago, describes the construction, application and advantages of the Barco Unit Tytampers.

Generating Sets—The construction and application of its model 36-A Diesel generating sets are described and illustrated in a 16-page bulletin issued by Fairbanks, Morse & Company, Chicago. The bulletin is known as No. 3600-A2.



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Only One Moving Part

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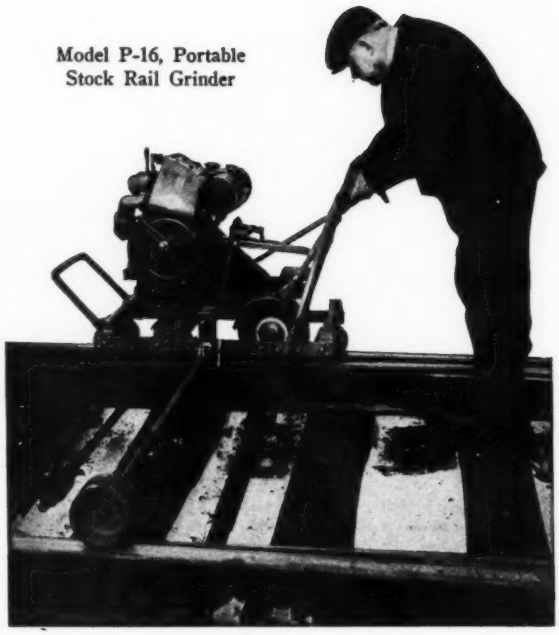

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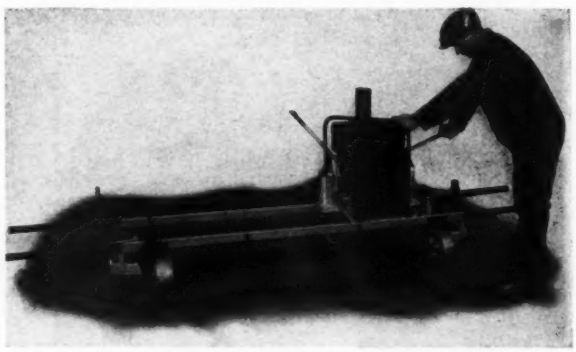
"In welding, the limiting factor is the rate at which the surface grinding can progress."

We quote a Division Engineer from the January issue of this paper. We add—and he'd doubtless agree—that the rate at which grinding can progress depends on the kind of grinder selected as well as on work organization. For maximum grinding progress on the job, excellence of work and equipment, examine the broad line of Railway Track-work Grinders. There's a type to meet practically any conditions and ideas.



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WORLD'S HEADQUARTERS FOR TRACK GRINDERS

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ALPHABETICAL INDEX TO ADVERTISERS
and list of their products

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Ingersoll-Rand....145
11 Broadway, New York City.
Air Compressors; Air Hoists; Air Lift Pumping System; Chipping Hammers; Compressors; Condensers; Hammers, Chipping, Calking, Riveting, Rock, Sealing; Hose; Pavement Breakers; Pneumatic Tools; Portable Grinders; Rail Bonding Outfits; Screw Spike Drivers; Tie Tampers.

Ingot Iron Railway Products Co.....140
Middletown, Ohio.
Automatic Drain Gates; Culverts; Metal Cribbing; Multi-Plate Pipe; Paved Invert Pipe; Part Circle Culverts; Perforated Pipe.

International Harvester Company, Inc.....151
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Tractors; Trucks.

Layne & Bowler, Inc.....220
Memphis, Tennessee.
Pumps; Water Supply Contractors; Well systems.

Lehon Company, The....219
44 to 45 Sts. on Oakley Ave., Chicago, Illinois.
Asphalt; Building Papers; Floor Coverings; House Lining; Insulating Papers; Roofing, Asphalt, Composition; Shingles, Asphalt, Composition; Waterproofing Fabrics.

Lufkin Rule Co., The....220
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Gages, Measuring; Rules; Scales, Tape; Tapes, Measuring.

Lundie Engineering Corporation, The....139
19 West 50 St., New York City.
Rail Anchors; Spring Rail Clips; Tie Plates; Tongs.

Maintenance Equipment Co.....131
80 East Jackson Blvd., Chicago, Ill.
Ballast Screens; Ballaster, Power; Car Stop, Friction; Derrick Cars; Flange Lubricators; Rail Layers; Switchpoint Protectors; Tie Spacers; Tools, Track.

Mall Tool Company....222
7746 So. Chicago Ave., Chicago, Illinois.
Grinders, Rail.

Metal & Thermit Corporation....211
120 Broadway, New York City.
Thermit Welding.

Morden Frog & Crossing Works....222
8 So. Michigan Ave., Chicago, Ill.
Articulated Crossings; Balkwill Crossings; Compromise Joints; Frogs; GEO Track Designs; Gage Rods; Guard Rails; Rail Braces; Switches.

National Carbide Corporation....222
60 East 42nd Street, New York City.
Calcium Carbide; Carbide Lamps; Lights.

National Lock Washer Company, The....225
Newark, New Jersey.
Lock Washers; Nut Locks; Spring Washers.

National Railway Appliances Association....135
208 South La Salle St., Chicago, Illinois.
Exhibit of maintenance of Way Materials and Equipment.

Nordberg Mfg. Co.....130
Milwaukee, Wisconsin.
Adzing Machines; Power Jacks; Rail Drills; Rail Grinders; Spike Pullers; Track Shifter; Track Wrenches.

Ohio Electric Mfg. Co., The....220
5905 Maurice Ave., Cleveland, Ohio.
Magnets.

Oxweld Railroad Service Company, The....149
230 No. Michigan Ave., Chicago, Ill.
Acetylene, Dissolved; Calcium Carbide; Gas, Acetylene, Gas Products; Generators, Acetylene, Carbic; Oxygen; Oxy-acetylene, Cutting and Welding Equipment; Torches, Oxy-acetylene Cutting, Welding and Heat Treating.

P. & M. Co., The....125
80 East Jackson Boulevard, Chicago, Illinois.
Rail Anchors; Rail Anti-Creepers.

Pettibone Mulliken Corporation....133
4710 W. Division St., Chicago, Illinois.
Crossings, Permanent Base; Frogs; Guard Rails; Mechanical Switchman; Switch Stands; Switches.

Portland Cement Association....154
33 West Grand Ave., Chicago, Ill.
Cement; Concrete Piles; Precast Concrete; Trestle Deck Slabs.

Q & C Co., The....217
90 West St., New York City.
Derails; Electric Snow Melters; Fence Posts; Fences; Fibre Insulation; Flangers, Snow; Guard Rail Clamps; Guard Rails; Joints, Compromise, Rail, Step; Lubricators, Rail and Flange; Knuckles, Emergency; Rail Benders; Rail Braces; Replacers, Car; Saws, Portable Rail; Sentry Signals; Skid Shoes; Snow Melting Devices; Snow Plows; Stands, Switch & Target; Thawing Outfits; Tie Plate Clamps; Track Insulation; Tools, Track; Ventilators; Weed Killer.

Racine Tool and Machine Co.....219
1738 State Street, Racine, Wisconsin.
Rail Cutters; Saws, Rail.

Rail Joint Company, Inc., The....213
50 Church Street, New York City.
Compromise Joints; Insulated Rail Joints; Rail Joints; Step Joints.

Railroad Accessories Corporation....127
405 Lexington Ave., New York City.
Drills, Rail; Power Track Machine; Tie Boring Machine.

Rails Company, The....226
178 Goffe Street, New Haven, Connecticut.
Track Construction; Track Fastenings.

Railway Maintenance Corporation....150
Freeport Road, Pittsburgh, Pennsylvania.
Banding, Tie & Timbers; Moles, Ballast Cleaning; Rail Joint Lubricators; Track Derrick, Demountable.

Railway Track-work Co.....218
3132-48 East Thompson Street, Philadelphia, Pennsylvania.
Cross Grinders; Track Grinders.

Ramapo Ajax Division....146
230 Park Avenue, New York City.
Crossings; Frogs; Guard Rails; Guard Rail Clamps; Manganese Track Work; Rail Braces; Rail Expanders; Switches; Switchstands and Fixtures.

Reliance Spring Washer Division....126
Massillon, Ohio.
See Eaton Manufacturing Co.

Republic Steel Corporation....158
Cleveland, Ohio.
See Truscon Steel Company.

Simmons-Boardman Publishing Corp.....142-220
105 West Adams Street, Chicago, Illinois.

Snow Construction Co., T.W.....217
232 So. LaSalle Street, Chicago, Illinois.
Agitators, Hydraulic; Chambers, Mixing; Feeders, Chemical; Floating Outlets; Sludge Systems; Water Treatment.

Standard Equipments....215
310 South Michigan Ave., Chicago, Illinois.
Rail Joints.

Syntron Company....218
Homer City, Pennsylvania.
Electric Power Units; Drills, Electric; Grinders, Portable Track; Power Plants, Portable; Tie Tampers; Tools, Electric.

Teleweld, Incorporated....152
80 East Jackson Blvd., Chicago, Illinois.
Frog & Switch Reclamation; Joint Bar Shims; Rail Slotting Equipment; Rail Heat Treating; Rail Welding.

Templeton, Kenly & Co.....223
1020 So. Central Ave., Chicago, Illinois.
Jacks, Track; Rail Puller & Expanders.

Tennessee Coal, Iron & Railroad Company....136-137
Brown-Marx Building, Birmingham, Alabama.
See U. S. Steel Corporation Subsidiaries.

Thompson & Company....223
Pittsburgh, Pennsylvania.
Rust Preventive.

Timken Roller Bearing Company, The....132
Canton, Ohio.
Bearings, Hand Car, Journal Box, Motor, Push Car, Tapered Roller, Thrust; Castings; Steel, Electric Furnace, Open Hearth, Special Analysis; Tubing, Seamless Steel.

Truscon Steel Co.....158
Youngstown, Ohio.
Bunk Houses; Crossings, Highway; Parts, Shed; Platform Canopies; Slabs, Intertrack; Shop Buildings; Tool Houses; Transfer Sheds; Warehouses.

Union Carbide and Carbon Corporation....149
30 East 42nd Street, New York City.
See Oxweld Railroad Service Co.

U. S. Steel Corporation Subsidiaries....136-137
Alloy Steels; Bars; Bolts; Cement; Fencing; Fence Posts; GEO Track Construction; Guard Rails; Joint Fastenings; Nuts; Rail Joints; Rails; Screw Spikes; Sheet Piling; Steel Alloy; Steel Plates and Shapes; Structural Steel; Tee Rails; Tie Plates; Ties; Tubing; Wire and Wire Products.

United States Steel Products Company....136-137
60 Church Street, New York City.
See U. S. Steel Corporation Subsidiaries.

Warren Tool Corporation....147
Warren, Ohio.
Adzes; Bars; Chisels; Forgings; Mauls; Picks; Sledges; Track Tools; Wrenches.

Williams & Co., J. H.....221
1 Spring St., New York City.
Chain Pipe Tongs; Clamps; Eye Bolts; Hoist Hooks; Lathe Dogs; Thumb Nuts and Screws; Wrenches, Drop Forges, Reversible Ratchet; Vises.

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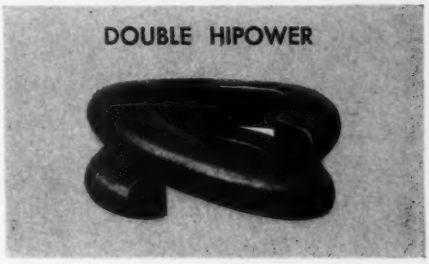

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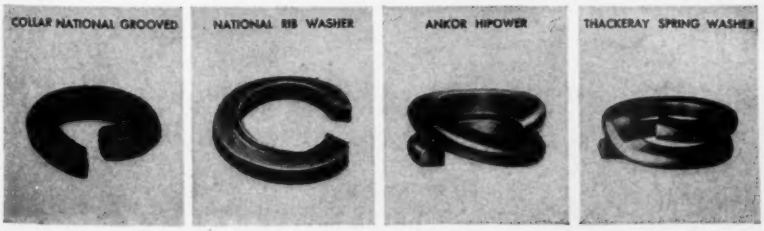

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